The Iron Age

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An American River Steamer—Performances of the Mary Powell.

BY THERON SKEEL, M. E.

The following paper contains the results of some experiments made on the steamer Mary Powell, running on the Hudson River between Rondout and New York.

The Mary Powell is acknowledged to be one of the fastest, if not the very fastest, boat upon the river. The details of the following experiments should be of particular interest to the engineer, as they are the first that have ever been published with any pretension to accuracy.

The speed of these North River boats has been very much overrated, and it is no unusual thing to find them set down in various semi-professional papers at various speeds up to 25 miles per hour. Such statements, of course, have no value. In the present series of experiments it appears that the boat never reached a speed of 20 miles per hour, corresponding to about one-half of the power required for 25 miles per hour.* (The miles used throughout this paper are the statute miles of 5280 feet.)

*Mr. Skeel undoubtedly has alluded to the regular or average speed of the boat. Exceptional runs have been made in which very much higher figures have been attained. Of the high speeds attained upon the Hudson River, Mr. Charles H. Haswell, the well-known engineer, has given us the following memorandum: "In 1867 the Mary Powell ran from Desbrosses street, New York, to Newburgh, 60½ miles, in 2 hours and 50 minutes, making three landings; and to Rondout, 91¾ miles, in 4 hours and 23 minutes, making seven landings; from Poughkeepsie to Rondout Light, 15¾ miles, in 39 minutes, flood tide[or 23.65 miles per hour]. In 1873 she ran from Milton to Poughkeepsie, light draft, in flood tide, 4 miles in 9 minutes. [This would be at the rate of 30 miles per hour; the rate of the tide is not known.] In 1874 she ran from Desbrosses street to Piermont, 24 miles, in 1 hour; to Caldwells, 43¾ miles, in 1 hour and 50 minutes; to Cozzen's Pier, 50½ miles, in 2 hours and 9 minutes, and to Poughkeepsie, making six landings, in 3 hours and 39 minutes, giving a speed of 22.77 miles per hour. The Mary Powell is said on another occasion to have run faster. [Dr. Van der Weyde said in 1877 that her fastest time was 26¾ miles per hour. Whether this was "through the water" or "over the bottom" we do not know.] In 1849 the famous Alida of New York ran from Coldspring to Pier 1, North River, New York, 43¾ miles, in 1 hour and 42 minutes, with an ebb tide of 2.75 miles per hour in her favor, making 22.19 miles per hour." It is evident to one acquainted with the river and the zigzag course taken by the boat in going to her landings, that she makes a somewhat greater mileage than that shown by the distances as given, hence Mr. Skeel's figures are entirely within the truth.

The following is a description of the boat and machinery:

Hull.	Feet.	In.
Length on water line	286	0
" over all	294	0
Beam at water line	34	3
" over all	64	0
Depth of hold	9	0
Hight from main deck to promenade deck	10	0
Hight from promenade deck to upper deck	8	0
Draft of water at mean load of passengers and coal	6	0
Square feet midship section (estimated)	200	0
Cubic feet displacement (estimated)	28,000	0
Projected area of surface resisting head wind, square feet	2,000	0

The personnel, exclusive of steward's department, consisted of:

Captain	1	Pilots	2
Engineers	2	Clerk	1
Firemen	4	Baggage master	1
Deck hands	4		
Total	15		

Length of trip, 5 hours and return.
Average number of passengers, 250.
Average fare per mile, 1¼ cents.

The hull is built in the usual style of the North River boats—that is, a shallow hull stiffened by immense hog-frames and masts and stays. The whole hull is as light as possible. No freight is carried. Passengers are carried on the main deck and on the next deck above. The upper deck is only of ⅝-inch pine and serves as a roof. The steward's department is in the hold.

The boat is propelled by one beam engine of the ordinary river boat style, built by Fletcher & Harrison in 1861. This engine is condensing, the condenser being under the cylinder, and the air pump is worked from the main beam.

Engine.	Feet.	In.
†Diameter of cylinder		72
Stroke of piston	12	0
Diameter of piston rod		8
" air pump		40
Stroke of "		62
Diameter of shaft		15
" journal		15⅝
" crank pin		8¾
Length of "		10¾
" journal		17
Diameter of wheels over tips of buckets	31	0
Length of each bucket	10	6
Width " "	1	6
Number of buckets to each paddle wheel	26	
Greatest immersion of outer edge of bucket at mean draft	3	6
Cubic feet displacement of piston per revolution	676	0
Cubic feet of clearance at both ends of cylinder	25	0
Diameter of steam and exhaust valve openings in steam chest	14	75

†Messrs. Fletcher & Harrison, 266 West street, New York, the builders of the engine and boilers, have kindly filled several blanks which were left in the dimensions of the engine by Mr. Skeel. The size of the cylinder was originally 62 inches, but when the boat was lengthened, in 1875, her weight was increased by some 40 tons. As the owners were adverse to increasing the steam pressure and wished to reduce it somewhat, in spite of the fact that she had new steel boilers, a new cylinder 72 inches in diameter was substituted for the old one. No other change whatever was made in the engine, the side pipe, nozzles, valves, &c., being all retained. The boat was lengthened because of her insufficient capacity to accommodate the increase of traffic. The additional displacement is of considerable advantage in passing through shoal water when loaded.

The steam to run this engine is furnished by two boilers, one placed on each guard. These boilers are forced by blowers. The boilers have steam chimneys and high sheet-iron stacks. All portions of the steam pipes boilers, cylinder, &c., except the side pipes and steam chest, are covered with non-conducting material.

The boilers are of the direct flue and return tubular type, built of steel stamped 72,000 lbs. and of the following dimensions:

Boilers (each).	Feet.	In.
Length over all	26	0
" of cylindrical shell	16	1
" of Fire-box	9	0
Width of "	11	0
Diameter of cylindrical shell	10	0
" steam drum	5	10
" " chimney	4	2
Hight of steam drum	12	0
Number of furnaces, 2.		
Width of "	4	10
Length of "	8	0
Length of direct flues	9	1
Diameter of tubes (external)	0	4½
Grate surface (2 boilers)	152	0
Heating " "	2,660	0
Superheating surface (2 boilers)	340	0
Cross area of lower flues (2 boilers)	23.2	
" " tubes "	17.2	
" " steam chimney (2 boilers)	25	0
Diameter of smoke-stack (two)	4	6
Hight above grate	68	0

Number of direct flues and diameter: 2 flues, 14 inches; 6 flues, 16 inches; 2 flues, 9 inches.

These experiments were made on the days when the writer went to and from the cities of New York and Newburgh. The time and state of the tide and wind were noticed at each end of the trip, and the time lost at the landings deducted. The time lost at the landings was considered to be the interval between the times when the bell rang to "slow" the engine on approaching the landing and when it rang to "go ahead fast" on leaving the landing. This allowance, which would be perfectly exact if the boat gained headway as fast as it lost it, is probably very nearly exact in practice. At the end of the season the total coal burned was furnished by the owner of the boat, Capt. I. H. Anderson, and, dividing the weight of coal by the number of trips, gives the coal per trip.

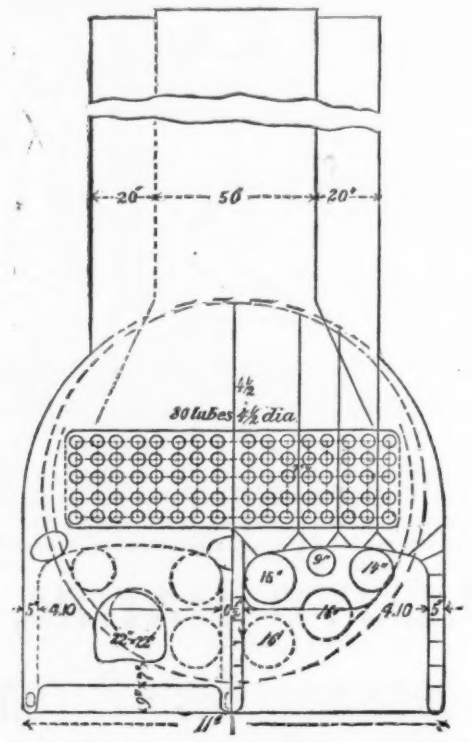
The point at which the writer left the boat (Newburgh) was very nearly two-thirds of the whole distance run. The coal given in the tables is coal used for all purposes—getting up steam, banking fires, &c. This consideration, which would seriously affect the accuracy of the result if the boiler had been burning coal at the slow rate incident to natural draft, becomes of no importance in this case, where the coal was burned at the rate of 40 lbs. per square foot per hour for 9½ hours out of the 24. The fires were allowed to go out on the arrival at Rondout in the evening, and rekindled each morning. The boat made one round trip from Rondout to New York and return each day, lying at Rondout 9½ hours and at New York 4½ hours.

The following are the results for three years:

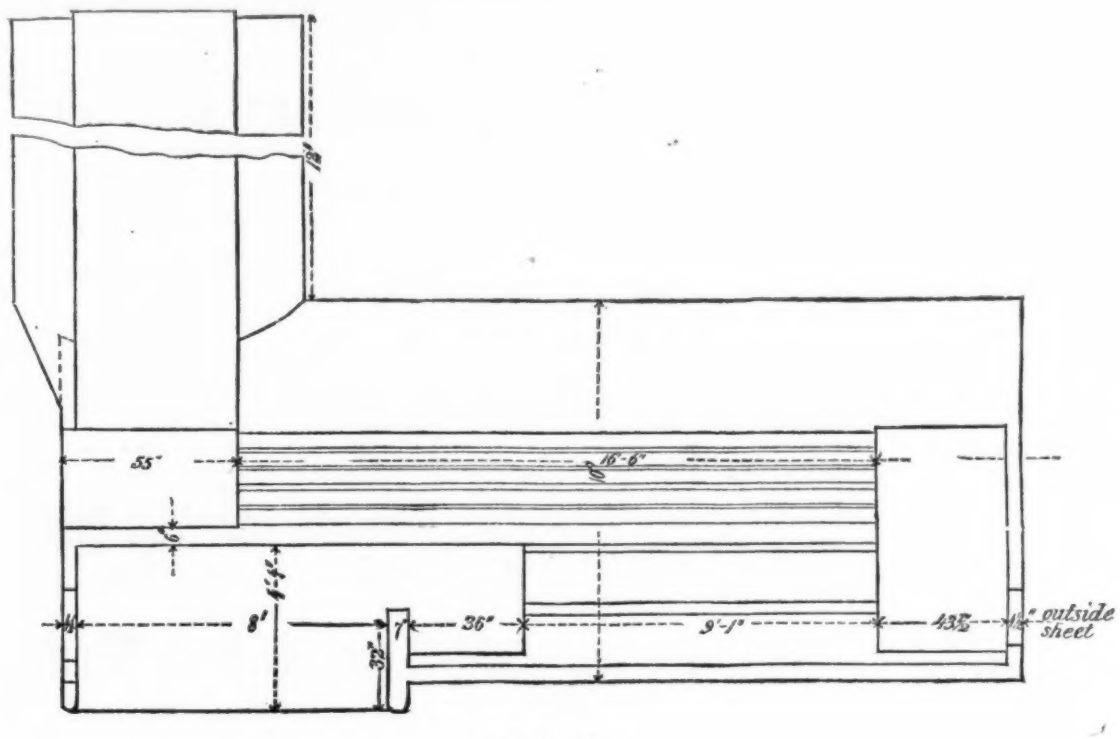
	1875.	1876.	1877.
Number of observations	....	12	27
Running time from Newburgh to New York or return, min.	185½	187½	182
Distance run in above time, miles	60	60	60
Revolutions per round trip from Rondout to New York and return	....	13,100	12,190
Distance as above	90	90	90
Revolutions per minute from Newburgh to New York or return, by counter	....	21.80	21.77
Miles per hour from Newburgh to New York or return	19.3	19.2	19.8
Coal per round trip, tons of 2240 lbs. each	23.79	22.85	24.25
Coal per revolution, lbs.	....	4.57	4.37
Slip of wheels, per cent. (calculated for center paddle)	....	14½	11.9
Revolutions from Newburgh to New York or return	....	4,007	3,963
Revolutions per mile from Newburgh to New York	....	66.8	66.0
Revolutions per mile per round trip	....	72.9	67.2

The fact that almost exactly two-thirds of the revolutions were made between Newburgh and New York indicates that the distance gone over by the boat, including curves to make landings, &c., was almost exactly twice as much below Newburgh as above. Unfortunately, I only had the coal given by the owner of the vessel for the round trip. To determine how much of this coal was burned below Newburgh a counter was attached to one of the fans blowing air under the boilers, which was read at Newburgh, and therefore gave the relative number of revolutions made by the fan both above and below Newburgh. It is assumed that the amount of coal burned is proportional to the number of revolutions of fan. The counter was attached to the fan engine for ten trips, during which time the main engine made 120,452 revolutions and the fan engine 419,837 revolutions, being 3.47 revolutions of the fan engine to one of the.

[*Continued on page 3.*]

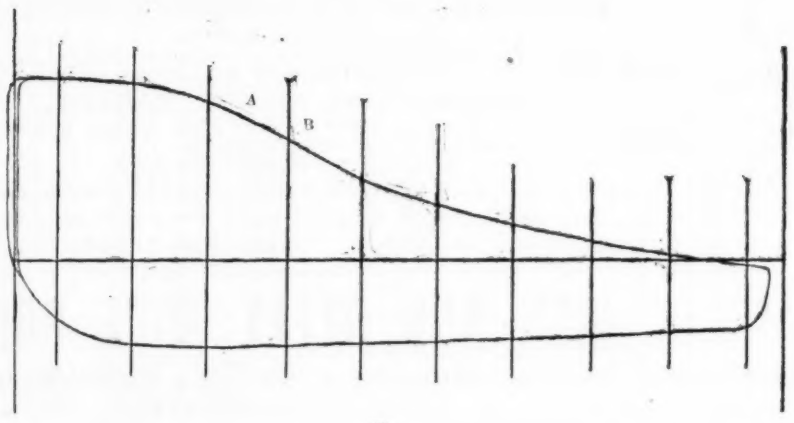


End View and Cross Section through Steam Chimney.

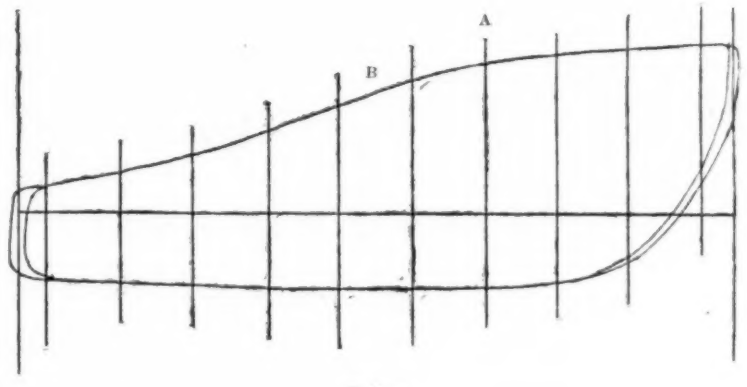


Longitudinal Section.

SECTIONS THROUGH THE BOILERS OF THE AMERICAN RIVER STEAMER MARY POWELL.



Top.



Bottom.

INDICATOR CARDS FROM THE ENGINE OF THE MARY POWELL.‡

‡ Both of these cards are dated June 27, 1877. The diagrams were apparently taken at 8.55 a. m. The following are the memoranda accompanying them: Steam, 28 pounds per square inch; vacuum, 25; throttle, ⅝; revolutions per minute for bottom card, 22.2; revolutions per minute for top card, 23.2; wind east.

At 9 a. m., counter	253,791	
At 10 a. m., "	255,150	
	1,359	
Whole hour		22.75
Mean pressure top card	22.8 [?]	pounds.
Mean pressure bottom card	25.7 [?]	"
l = 9.4 inches top card.		
l = 9.7 inches bottom card.		
Scale 24 pounds to the inch.		
Horse-power	22.8	
	25.7	
	48.5	= 24.25

$$\frac{24.25 \times 4000 \times 24 \times 23}{33{,}000} = 1620$$

The original cards were very faint, and the pencil had apparently gone over the paper several times, and at the ends the lines were quite broad. The double lines in the reproductions indicate the outside limits of the original pencil lines. The points at which the valves began to close are probably to be found directly beneath the letters A and A while the final closure of the ports probably did not take place until the points B and B were reached. We judge that in measuring the cards Mr. Skeel had entered the wrong figures, as we make the mean pressure of the top card 22.56 instead of 22.8, and the mean pressure of the bottom card 23.08 instead of 25.7. This would make the horse-power 1560. This mistake in the figures could easily be made, as several figures on the cards closely resemble those used in the calculation, and in turning the cards over the mistake was probably made in reading. The engravings are the same size as the original cards.

‖ In explanation of the discrepancies in the performance of the boat for 1876, the falling off in the speed and increase of coal consumed, Messrs. Fletcher & Harrison suggest that this was probably due to the greatly increased loads carried during the Centennial. This seems probable in view of the enormous amount of travel on the North River during the summer and fall of 1876. There are, however, certain discrepancies between the slip number of revolutions, &c., which may be traceable to other causes.

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SEE PAGE 9.

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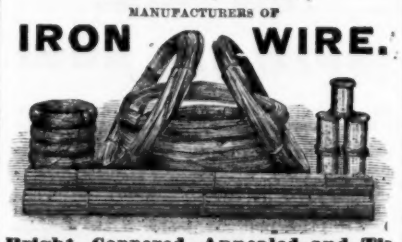

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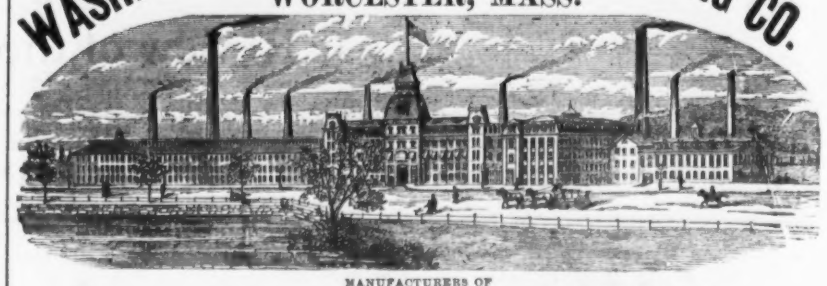

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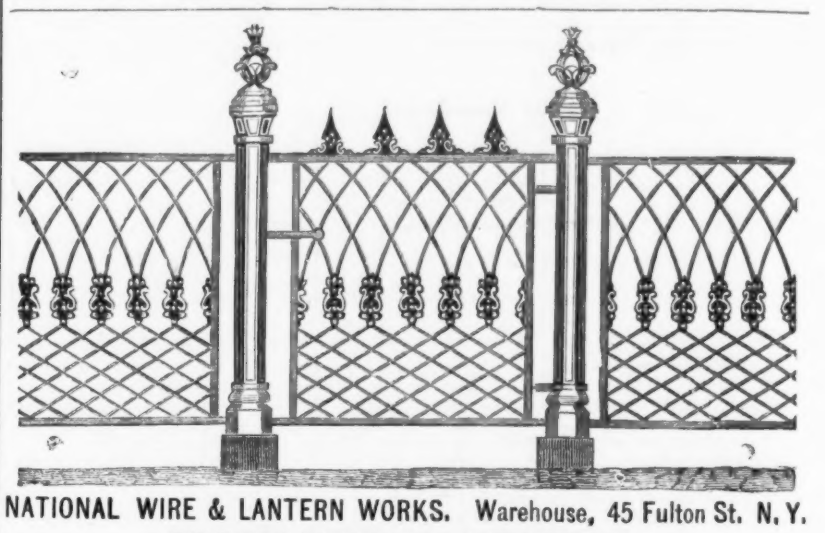

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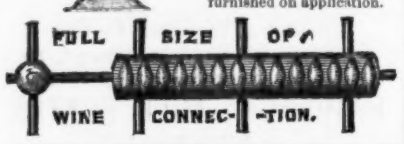

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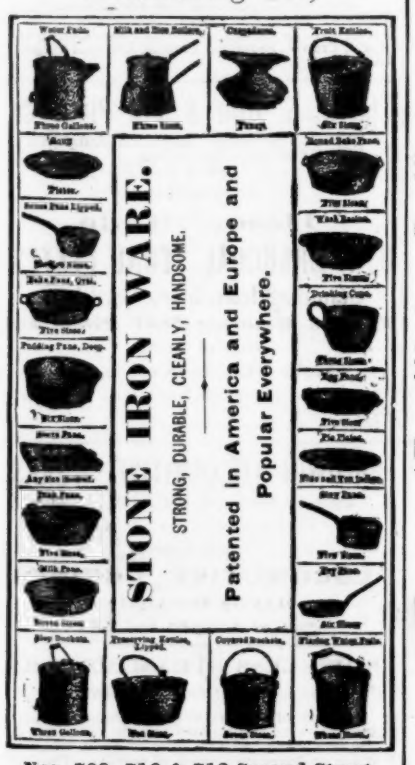

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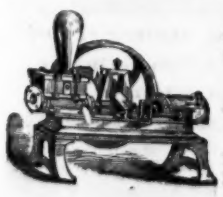

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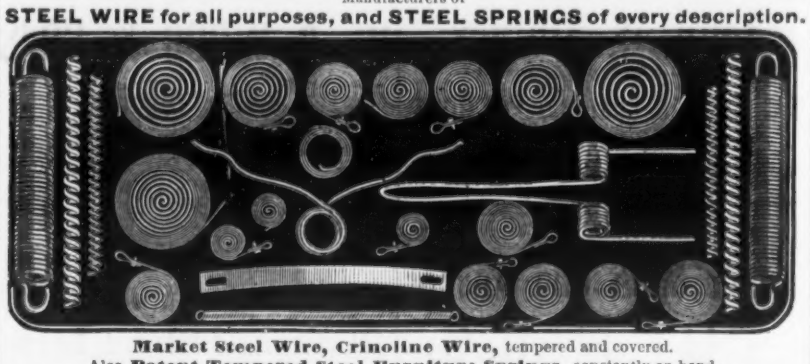

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BEST REFINED TOOL CAST STEEL
For Edge and Turning Tools, Taps, Dies, Drills, Punches, Shear-Knives, Cold-Chisels and Machinists' Tools generally.
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For Circular, Mulay, Mill, Gang, Drag, Pit and Cross-Cut Saws.
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For Boilers, Fire-Boxes, Smoke Stacks, Tanks, &c.
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For Shafting, Spindles, Rollers, &c., &c.
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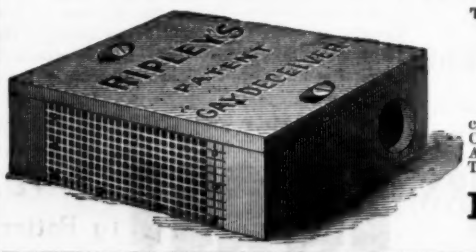
Best Catch-Alive Mouse Trap.



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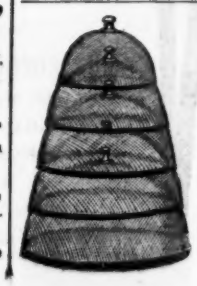

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And all kinds of
Oyster & Steak Tin Wire Broilers, Meal & Flour Sieves.
PATENT DOMESTIC COFFEE POT,
Latest and best improvement in the market.

[*Continued from page 1.*]

An American River Steamer—Performances of the Mary Powell.

main engine. In observations made on engines from New York to Newburgh the results were as follows:

Revolutions of main engines.	Revolutions of fan engine.
4.454	15,572
3.729	13,955
3.944	13,305
3.729	12,548
3.991	15,054
3.902	13,312
4.199	15,252
Total... 27,948	98,998

From which it appears that it took below Newburgh 3.57 revolutions of the fan to give one of the engine. When it is considered that a little coal is burned to get up steam, &c., when the fan does not run, indicates that the coal may be without sensible error assumed to be burned uniformly over the whole route.

The indicator cards were taken during 10 trips from each end of the cylinder through a pipe 6 inches long tapped into the nozzle. The whole number of cards was 45. The power was very nearly constant. These cards probably represent a fair mean of the power developed, as the speed and coal represent a mean. The cards were taken by the writer with great care. Specimens of the cards are given below.

The following is the mean result of 1877:

Number of miles run	15,300
Hourly Quantities—Speed of boat, in miles (5280 feet)	19.8
Number of revolutions of engines	1,306
Pounds of coal consumed	5,970
" combustible (ashes 16⅔ %)	4,870
Boilers—Pounds of coal per square foot of grate per hour	39.3
Pounds of combustible per square foot of grate per hour	32.8
Pounds of coal per sq. ft. heating surface.	2.25
" combustible per sq. ft. heating surface	1.88
Temperatures—Atmosphere	70°
Hot well	120°
Feed water	120°
Chimney gas	Zinc melts
Pressures—Steam, pounds	28.0
Vacuum, inches of mercury	25
Syphon gauge in ash pit, inches of water.	1½
Indicator Card—Initial pressure, pounds above zero	40.0
At point of cut off, pounds above zero	31.2
End of stroke, " "	16.4
Mean back, " "	5.6
End of cushion, " "	40.0
Mean total pressure, " "	20.94
" indicated " " "	24.34
Net pressure, friction 1½	22.84
Point of cut off	0.47
" where cushion commences	0.80
Power—Total horse-power	1,899
Indicated "	1,540
Net "	1,446

The weight of steam discharged by the cylinder into the condenser each hour may be computed from the indicator cards as follows:

Displacement of piston per hour	877,632
Add clearance	32,650
Volume of steam discharged	910,282
Pressure	16.4
Pounds of steam discharged	39,100
Pressure at end of cushion	40
Weight of steam saved	3,200
Net weight of steam discharged	35,900
Steam condensed for work	1,500
Total steam drawn from boiler by main engines	37,400

The terminal pressure as measured on card was 16.4, while the terminal pressure, computed from the pressure at the point of cutting off, by Marriott's law was:

$$((672 \times .49) + 25)\ 31.2 \div 697 = 15.2,$$

Indicating that, in spite of the superheating, some condensation and reëvaporation took place. The whole internal surface of the cylinders, both heads, nozzles, both sides of piston and surface of piston rod, is about 400 square feet. If the steam had not been superheated at all, it would have been condensed by this surface at the rate of 20 lbs. of steam per square foot per hour, or 8000 lbs. per hour. The total steam drawn from the boilers, therefore, under this supposition would be 45,400 lbs. per hour. The amount *actually* drawn is certainly more than 37,400 lbs. and less than 45,400 lbs.

It is unfortunate that we have no means of measuring the water used. Assuming that the engine used 42,000 lbs. of steam per hour, we have the economy as follows:

Boiler.—Pounds per Hour.	
Water per lb. of coal from 120°	7.0
" " " 212°	7.8
" " combustible, 120°	8.2
" " " 212°	9.1
" sq. ft. heating surface from 212°	0.14
" " area of ebullition " 120°	0.12
Engine.	
Pounds of steam per hour per Total horse-power	22.1
Indicated "	27.3
Net "	28.9
Pounds of coal per hour per Total horse-power	3.14
Indicated "	3.87
Net "	4.13

The writer has been asked many times what proportion of the power of these boats was lost through the resistance of the air and wind on the decks and cabins. These experiments serve to show that this loss does not exceed 10 per cent. of the power applied. That is to say, when running through still air and still water, about 90 per cent. of the power is absorbed in overcoming the resistance of the water and 10 per cent. in overcoming the resistance of the air. In this connection it must be remembered that of the total surface resisting the wind (2000 square feet), a considerable portion, being the hull of the boat, the paddle boxes and smoke-stacks (at least 800 square feet), is necessary, and could not be reduced even if the upper decks were left off.

The table following shows experiments from which this result was deduced:

	June 26	June 27	July 3	July 15	July 18
Force in miles per hour	5	0	10	5	10
Direction	Head	....	Fair	Head	Fair
Speed of boat in miles per hour	19.3	19.8	19.3	19.5	20.6
Revolutions per minute	23.10	23.65	21.71	22.50	22.70
Net indicated pressure	23.13	22.60	22.04	23.39	23.32

Mean Results from Above.

Force in miles per hour	10	5	0
Direction	Fair	Head	....
Speed of boat	19.9	19.4	19.8
Net horse-power	1462	1337	1490
Relative power for same speed, calculated by cube of speed	97.9	109.4	100.0

It appears from the foregoing that the indicated horse-power of this boat during the whole season was 1540, and that the horse-power applied to turn the shaft was 1446, from which it appears that the power applied to propel the vessel was (100 — 11.9) 1446 = 1275.

The values of the coefficient

$$A' = \frac{\Delta^{\frac{2}{3}} V^3}{H.P.}$$

becomes:

$$A' = \frac{200 \times 7760}{1275} = 1210$$

or, in round numbers, there is required 8 indicated horse-power for each square foot of midship section when the boat is driven at 20 miles (of 5280 feet) per hour, giving a value to the constant (when the indicated horse-power is taken):

$$A = \frac{200 \times 776}{1540} = 1000 \text{ nearly};$$

or, if the speed is taken in nautical miles (6080 feet):

$$A = \frac{200 \times 489}{1540} = 635$$

The only vessel on record which has given a speed at all comparative is the United States steamer Wampanoag, now called the Florida. (See report Secretary of Navy, 1868 and 1869.) This vessel, with a midship section of 735 square feet and a draft of water of 19 feet, attained a speed of 19.3 statute miles, with an indicated horse-power of 3750, of which 3000 was usefully applied to propel the ship. The coefficients for the two vessels were:

Mary Powell = 200 × 7760 ÷ 1275 = 1210
Wampanoag = 735 × 7190 ÷ 3000 = 1760

From this it appears that the resistance of a shallow vessel at the same speed is more than for a deep one per square foot midship section. The Mary Powell runs for two-thirds of the distance in fresh water; the Wampanoag was tried in salt water. The Mary Powell is a side-wheel vessel and the Wampanoag a screw vessel.

How far these differences may affect the result the writer does not know.

Ohio Coals.

Regarding the coal resources of the State of Ohio, the Inspector of Mines, Andrew Roy, reports that there are 16 different seams which exceed 2 feet in thickness. There are several other seams, but they are very thin, not exceeding 2 to 6 inches in hight, and often of quite limited area. Thirteen or fourteen of the series are of workable thickness in many places of the coal field, but with the exception of No. 6, all the lower workable coals are subject to faults, or become so reduced in hight as to be of little or no commercial value over large areas where they are due. Even No. 6, which in many places in Perry, Jefferson and Tuscarawas counties rises to a magnificent hight of 8 or 10 feet, dwarfs to 2½ feet, then down to a mere trace, and sometimes disappears altogether. No. 8, the Pittsburgh seam, is remarkable for its continuity where it is due and for its presence in workable hight.

Though there are numerous wants in the different coal beds of the State, there is a general continuity of the seams from outcrop to outcrop. The coals of the Mahoning Valley and Massillon regions have their representatives in the Jackson and Lawrence districts. It is suggested that the wants or interruptions are the result of water spaces existing in the old coal plain of the time of the deposition of the coal vegetation, and also of denuding forces and the rolling or hilly character of the coal marsh. Where wants are met in any of the seams having level floors, the coal has been eroded by currents of water in rapid motion passing over the loosely matted, peaty material, and cutting or washing channels through part or the whole thickness of the peat bog during the first stages of the subsidence of the coal. Sandstone, fire-clay or shales, usually the former, are found usurping the place of the eroded coal where wants are found in any of the seams due to erosive agencies or to original water spaces. The floor of the coal beds is almost invariably wavy and rolling, the high arches or hills containing barren ground. The coal is seen to become gradually thinner in ascending these hills, and finally to disappear altogether. This wavy character of the coal floors is more marked in the lower than in the upper coals of the series, and is most marked of all in the lowest seam, or coal No. 1.

The strata associated with the different beds of coal are composed of shales, sandstones, limestones, iron ores and fire-clays in alternating layers. None of these sheets except the fire-clays forming the floor of the coal beds are persistent like the coals, but appear and disappear at frequent intervals. The shales are replaced by sandstones, the sandstones by shales, the limestones change to pure or calcareous shale or sandstone, and the iron ores also become changed to other rocks. The first deposition of sedimentary material which formed over the coal after the subsidence of the coal marsh was very generally mud (now shale), though sandstone, impregnated with the remains of the coal flora, showing that this was the first formation, is sometimes found forming the coal roof. Frequently a sandstone is met, but shale was the first deposition and was subsequently removed. None of the sheets forming the coal strata are very thick. Masses of material, either sandstone or shale, several hundred feet in thickness are met, but on close examination they are found to change in color and character, the alternating shales being black, blue, gray, &c., and the sandstones being light, red, buff, gray, &c.

The coal production has been 5,315,294 tons in 1872, 5,450,028 in 1873, 3,207,585 in 1874, 4,868,259 in 1875, 3,500,000 in 1876, 5,250,000 in 1877.—*Cleveland Trade Review.*

The plumbers of Edinburgh, to the number of 200, were on strike a few days ago in consequence of a notice issued by the masters that the men would be required to walk to their jobs, when within city boundaries, in their own time. We should think it rather a curious thing in this city if a man expected his "time" to begin when he left home to go to work.

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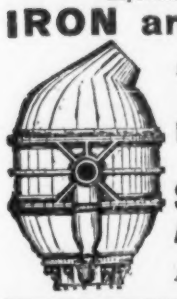

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PATENT
Planished Sheet Iron.
Patented March 14th, 1865; April 8th, 1873; Sept. 9th, 1873; Oct. 6th, 1874; Jan. 11, 1876.
Guaranteed fully equal in all respects to the
IMPORTED RUSSIA IRON,
and at a much less price.
FOR SALE,
by all the principal
METAL DEALERS
In the Large cities throughout
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COYNE & HATRY,
Patentees and Manufacturers of
Automatic Nail Selectors,
IMPROVED CUT NAIL MACHINES,
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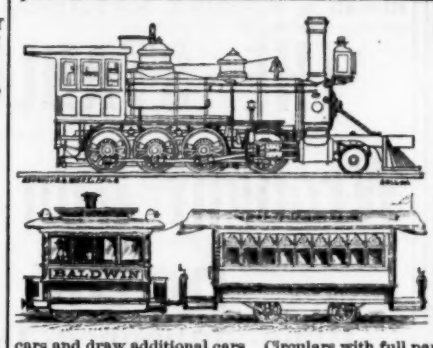
HORSE SHOES.
Nails and Spikes,
STEEL TOE CALKS.
Horse Shoe Bar
AND SHEET IRON.
SHOENBERGER & CO. Pittsburgh, Pa.



cars and draw additional cars. Circulars with full particulars supplied.

Iron.

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EVERSON, MACRUM & CO.
Pittsburgh, Pa.,
Manufacturers of every description of
Bar, Sheet and Small Iron,
Make a specialty in
Fine and Common Sheet Iron.

A. G. HATRY. PORTER C. FRIEND.
HATRY & FRIEND,
Commission Merchants
AND DEALERS IN
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Nails & Spikes, Steel & R. R. Supplies,
WINDOW GLASS, GAS PIPE & BORAX.
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MANUFACTURERS OF
Armor Plates
FROM
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Ten and a Half Feet Wide and Fifteen to Twenty Feet Long.

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SHAFTING, DRAWBAR IRON, MERCHANT BAR IRON, &c., &c. Also
HEAVY AND LIGHT FORGINGS
Of all kinds
FOR CARS, LOCOMOTIVES AND ENGINES,
Including Drawbars, Axles (either hammered or rolled), Driving Axles, Locomotive Frames, Steamboat Shafts, Cranks, Propeller Frames, Oil Tool Forgings &c. &c.

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Home Made
U. S. CHARCOAL TERNE PLATES,
Stamping Iron, Show Card Iron,
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Stove Pipe Iron cut to size.
Special sizes of Pickled and Cold Rolled Iron made to order.
Send for specification and price list.

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BURNHAM, PARRY, WILLIAMS & CO., Proprietors,
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Manufacturers of
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NOISELESS STEAM MOTORS,
For city and suburban Railways.
These machines are nearly noiseless in operation; show no smoke with the use of anthracite coal or coke as fuel, and show no steam whatever under ordinary conditions of service. They can be run at two or three times the speed of horse

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ESTABLISHED 1828.
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SHEET and TANK IRON—BOILER, TANK and SAFE RIVETS,
Best Lap-Welded Iron Boiler Tubes,
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Freight engagements made to all parts of the world. Marine insurance effected in reliable offices.
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For Iron and Steel Rails, Car Wheels, Boiler and Sheet Iron and General Railway Equipments.
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The "BLUE" (Red Short) and "RED" (Neutral) Bessemer Ores, from Hacklebarney and Chester, New Jersey.
Price "Blue" Ore hand-broken and selected for April is $2.50 cash, f. o. b. Hacklebarney Mines.
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Wrought Iron Roof Trusses, Beams, Girders & Joists,
and all kinds of Iron Framing used in the construction of Iron Proof Buildings.
DECK BEAMS, CHANNEL, ANGLE AND T BARS
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REFINED BAR, SHAFTING, and every variety of SHAPE IRON made to Order.
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SAMUEL J. REEVES, President.

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LOCOMOTIVE AND CAR WHEEL TIRES,
Manufactured from the celebrated OTIS STEEL.
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Quality and efficiency fully guaranteed. Prices as low as any of the same quality.
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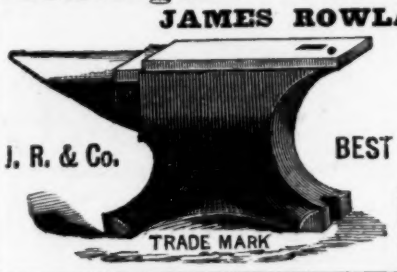

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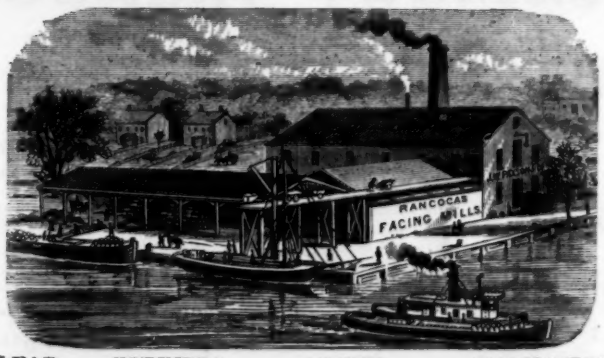

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H. E. COLLINS & CO.,
BROKERS IN
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IRON, NAILS
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Pig Iron, Iron and Steel Rails,
METALS,
Railway Supplies, Old Rails and Railway Scrap,
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CENTRAL IRON WORKS, - Harrisburgh, Pa.
Boiler Plate, Tank Iron, &c.,
PIG, BAR AND RAILROAD IRON,
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DELAWARE AVENUE ABOVE CALLOWHILL STREET, connected by track with railroad
Cash advances made on Iron.

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Exclusively for the
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This laboratory was established in 1866, at the instance of a number of practical Iron Masters, expressly to afford prompt and reliable information upon the chemical composition of the substances above mentioned, for smelting and refining purposes. The object being to make it at once a convenient, practically useful, and comparatively inexpensive adjunct to the Furnace, Forge and Rolling Mill.

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For determining the per cent. of Pure Iron in an ordinary Ore	$4.00
For the per cent. of Pure Iron, Sulphur and Phosphorus in do	12.50
For each additional constituent of usual occurrence	1.50
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Printed instructions for obtaining proper average samples for analysis furnished upon application.

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Manufacture
Extra quality small Rods, from best selected Scrap Iron
SWEDISH AND NORWAY SHAPES,
Nail and Wire Rods. Also,
Horse Shoe Iron, Hand Made Horse Shoes & the Boston Horse Shoe.
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Manufacturers of every description of
PLATE & SHEET IRON
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YOUNGSTOWN, OHIO.

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PIG IRON
Blooms, Bar, Sheet & Hoop Iron.
217 N. Third St., St. Louis.

PATENT MINERAL WOOL,
The Best and Cheapest Non-Conductor or Insulator of Heat or Cold.
Used for covering steam pipes, boilers; for lining water pipes, hydrant and street washer boxes, refrigerators, cold storage houses, &c. Cheap enough for deafening walls of dwellings, factories, &c. State rights for sale. Send for circular to
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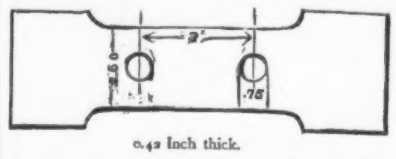
BORAX.
Concentrated Borax in sacks.
Selected concentrated Borax in barrels.
Refined Borax in cases.
Pulverized Borax in barrels.
Pulverized Borax in pound and half pound packages.
Being *Sole* Agents for *Messrs. Smith Bros.*, OWNERS OF THE MINES, we are enabled to sell at the *lowest prices.*
WM. T. COLEMAN & CO.,
NEW YORK, 180 Pearl Street.
SAN FRANCISCO, CAL., cor. California and Front Sts.

The Kennedy Spiral Punch.

An American tool—the Kennedy spiral punch—has recently been attracting considerable attention in England. Although used in a large number of the principal shops in this country, it has had little or no public attention. Mr. D. L. Kennedy, of No. 3 Vesey street, New York, is the inventor.

This tool gives the punching machine as wide a range of work as the ordinary plate shears; that is to say, the power of the machine is not measured by the size of the work, but by the thickness of the plate. With the spiral punch the strain upon the machinery is practically the same for punching a 2-inch hole in a 1-inch plate or a 4-inch hole. In other words, with a given thickness of plate, after a certain size of hole is reached, the shearing strain upon the punch is not increased at all by increasing the size of the hole. This is accomplished by punching only a part of the hole at a time in precisely the same manner that a plate is sheared. The new punch may be termed a pair of shears wrapped around a mandril. We have on our table a circular blank 1 inch thick and 4 inches in diameter which was punched at the West Point foundry in a press which could only drive a 2-inch punch of the ordinary pattern through the same iron. The holes left by the spiral punch are very perfect. Little or no taper can be found in them, and it is apparent that the material has been but slightly disturbed. English experiments prove that the strength of a plate is reduced less when punched with the spiral punch than with the ordinary pattern. A plate of the form shown in the sketch, but with only one hole



0.42 inch thick.

in the center, was tested for tensile strength. When the hole was punched in the ordinary way the plate broke at 38,579 lbs., but when the hole was punched with the spiral punch the breaking strain rose to 63,929 lbs. Another set of experiments was made with eight plates punched with two holes each, as shown in the sketch, one with the ordinary and the other with the spiral punch, but the plates broke in every case at the hole punched in the ordinary way, showing how much less the material is injured by the shearing action of the new punch. The following table shows the results of some experiments by Mr. F. W. Webb, of the London and Northwestern Railroad, at Crewe. In part of the plates there was only one hole, in the others there were two:

RESULTS OF EXPERIMENTS MADE AT CREWE ON THE TENSILE STRENGTH OF SAMPLES OF THE SAME PLATE PUNCHED WITH KENNEDY'S SPIRAL AND ORDINARY PUNCHES RESPECTIVELY.

Diameter of hole.	Breaking W'ght of Plate. Actual.	Breaking W'ght of Plate. Per square inch.	Elongation. On 9 inch of length across holes.	Elongation. Per cent.	Area of Plate under tension.	Remarks.
	lb	lb.				
.885	45,350	63,752	.11	5.5	.7114	Punched with ordinary punch.
.885	45,000	60,318	.23	11.5	.7461	
.895	42,400	57,495	.14	7	.7375	
.89	37,050	51,287	.03	1.5	.7224	
.89	42,800	60,692	.06	3	.7052	
.90	45,150	61,047	.07	3.5	.7396	
.895	39,000	55,465	.09	4.5	.7032	
Mean	42,393	58,579	.104	5.2	.7236	
.885	45,850	63,285	.27	13.5	.7245	Punched with Kennedy spiral punch.
.88	48,000	67,672	.25	12.5	.7093	
.88	46,200	63,584	.23	11.5	.7266	
.88	44,250	61,254	.12	6	.7224	
.88	45,500	64,148	.26	13	.7093	
.895	47,600	66,084	.27	13.5	.7203	
.885	45,600	61,476	.09	4.5	.7418	
Mean	46,143	63,929	.21	10.6	.7220	
.885	40,350	55,693	.21	10.5	.7245	Punch'd with both punches. Fracture occ'd in every case through only p'ch hole.
.89	41,800	59,274	.08	4	.7052	
.895	44,350	63,073	.24	12	.7039	
.885	45,400	62,664	.24	12	.7245	
.885	42,100	58,109	.24	12	.7245	
.89	45,450	62,925	.23	11.5	.7224	
.89	34,300	47,480	.07	3.5	.7224	
Mean	41,964	58,458	.19	9.3	.7181	

The spiral punch has received many strong indorsements from leading manufacturers, and is doing good work wherever used.

Patent Self-Feeding Reamer.

Messrs. Newton & Cox, of Cleveland, Ohio, are making a new self-feeding reamer, of which we give an illustration. There are several practical advantages gained by the construction of this reamer in this form. By means of the thread it feeds itself by merely turning it; there is, consequently, no need of driving by hammering, and by so doing injuring the reamer externally or disturbing or destroying the internal structure and character of the metal. The manufacturers claim there is for the same reason little, if any, need of pushing it forward, as the thread works its own way. The feeding thread, in its advance, cuts or scores the metal, thus breaking up the solid surface and leaving less severe work for the reamer, which thus performs its duty much quicker and with less expenditure of power. From what has been said it is to be expected that it will make a straight, true hole, the thread part serving as an advance guide for the rear or reaming part.

These reamers are all accurately ground to the gauge and backed off after they are hardened and relieved by honing with an oil stone. The firm are making a specialty of milling and grinding machines, as well as all kinds of machines for fine work.

The Dangers of the Export Trade.

To the Editor of The Iron Age.—DEAR SIR: Veteran merchants in the export trade, and those who are really the representative men of the conservative class, again and again call upon the newspaper press to sound the note of warning. Speaking more particularly of the line known as hardware with which these gentlemen have chiefly to do, they state the situation in a few words and intimate the possible consequences if the high pressure now brought to bear upon the exporting interest is continued. An old merchant makes the following statements on this subject:

Orders from Australia are being executed in this market at 2½ per cent., currency, on the dead cost of goods. It costs the merchant from 1½ to 2¼, according to the size of business, to execute the orders. The mode of payment is 60 days draft on the merchant in Australia, which draft is negotiated in London. It is therefore at least 100 days before the New York merchant is relieved of his responsibility, and that on a basis of profit of from one half to one per cent.

In case of the failure of a merchant in Australia the first creditor to be provided for is his local banker. The next is the English manufacturer who has his agents on the spot, and the last would be the American merchant, who thus becomes the guarantee of them all, and who, in case of disaster, is sure to be left out in the cold. And all this hazard is incurred in the chance of gaining not to exceed 1½ or even 1 per cent. profit. We are reminded, in the interest of those directly concerned, that men who have been through this mill know how it is; that they speak from experience.

In a word, the thing is overdone. Very evidently, judging from the quantities of goods being sent out, the comparatively limited field for consumption, the character of too many of the purchasers and the extravagant views often expressed, or rather the "great expectations," somebody is making bad business calculations. Holders of stock seem to be dazed by the prospect of fine orders and wild reports of what their neighbors are doing; the general effect being heightened, perhaps, by the official statement of current exports furnished by the custom-house. Another fact especially deserving of attention is that the wild exporting *furore* in the United States is causing alarm in the foreign markets.

Goods that could have been sold a year ago in England and Germany cannot be sold to-day, because the foreign manufacturer in many instances has reduced his prices under the pressure of American competition. Perhaps the question is asked, "How frightened?" "Why?" The answer comes, "England and Germany are put on their metal and are resolved not to be undersold on their own ground." They are "playing the Yankee," so to speak, and goods are now produced by them at a lower cost. A chief ground for anxiety is the fact that credits are given recklessly. For example, here is a man in Australia of whom the manufacturer knows nothing, except by meager report, to whom he offers to sell on six months' time after arrival of documents (meaning the invoice and bill of lading), making at least eight months before money can be realized in New York. The same manufacturer probably would refuse a buyer in Utica or Syracuse possessing no better credentials, and of whose standing he could be constantly informed. A leading merchant in New York who has had much experience in the foreign exporting business affirms that he has refused more orders this last year than ever before; that he has refused over 200,000, and that the business thus rejected has been eagerly grabbed up by competitors as though they had a fine thing.

Notwithstanding the foregoing remarks in regard to reduction in prices made by foreign manufacturers, the United States are still under in price compared with any rival in large lines of goods. Moreover, purchasers are forward in obtaining long credits. It is an actual fact that influenced by the prevailing feeling merchants in this country will sell abroad on better terms than at home. The point to be made in the foregoing observations is, that while undoubtedly we have a grand field for the export trade and a greater one in the future, it is certain that the matter is being mismanaged. At least this is the positive assertion of those who claim to speak without the bias of self-interest, and those who are making reckless ventures are, by the same authority, advised to dismiss their rosy dreams and come down to real work; in other words be governed by business principles and not by mere enthusiasm. There is plenty of business, but it must be done in a business way. Payments from fur dealers must be made secure, otherwise disaster must follow, and a mishap now would throw back the export trade for years to come.

Yours respectfully, W. H. H.

The Phonographic Talking Clock.—The latest and most novel application of Mr. Edison's phonograph is a talking clock. This clock instead of striking can be made to say any particular words, such as "get up John," "get up Bridget," or if set for the hour of evening devotions would say "prayer," &c. This was explained in our hearing at the Cliff street office of the Ansonia Brass Co., who have bought the right from Mr. Edison, and having spent a large sum in perfecting the application, promise to put their goods on the market very soon. One of the novelties is a large metal frog which sits beside the clock in a listening attitude; the jaw wags, dismal croaks are heard and then sepulchral words come from the creature's throat. In these clocks the time mechanism is arranged at one side of the "movement" and the phonograph is attached to it, the latter consisting of nothing more than a disk or roller with a diaphragm or sounding metal plate, while indentations are made on the rollers by a small point placed beneath. An "advertising clock" is also in preparation, which it is surmised will be presented as a gift and gladly accepted by railroad companies, &c., the peculiarity being that instead of striking, the clock shouts "Smith's crushed coffee," "Jacob's cheap jewlery," or anything else desired.

Iron.

CLEVELAND ROLLING MILL CO.,

Manufacturers of

Bessemer Steel & Iron Rails & Fastenings,

SPRING STEEL AND WIRE of all kinds,

STEEL HORSE SHOES, TIRE, AXLES & other Forgings.

Boiler Plate, Galvanized & Black Sheet Iron, Corrugated Roofing & Siding of Siemens-Martin, Bessemer Steel & Iron.

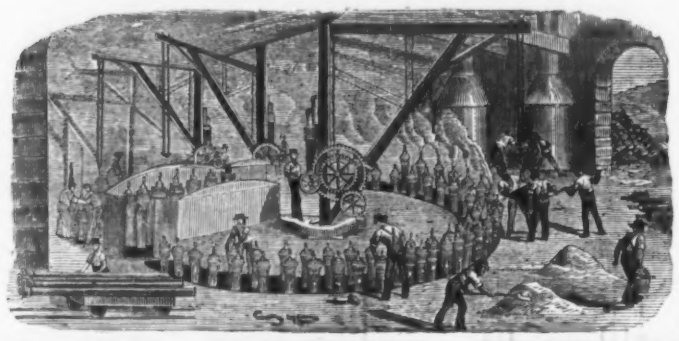
All made from our own Lake Superior Ores. **CLEVELAND, O.**

Agents for the UNION STEEL SCREW CO.

McNEALS & ARCHER,

BURLINGTON, N. J.

Flange Pipes.



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CAST IRON PIPES

FOR WATER AND GAS.

JAPANNERS. DECORATORS.

Light Castings and Metal Patterns

A SPECIALTY.

TAYLOR & BOGGIS,

Iron Founders,

Nos. 65, 67, 69, 71 & 73 Central Way, CLEVELAND, O.

CORRESPONDENCE SOLICITED.

Will make estimates on completed work when desired.

HOLLOW CHILLED ROLLS.

U. S. PATENTS, Nov. 9, 1869, and Oct. 9, 1877. ANY REQUIRED DIAMETER OR LENGTH.

Suitable for Plate, Sheet, Nail Plate, Pipe Iron, Bridge Iron. Either Iron or Steel Rolling.

Orders addressed

TOTTEN & CO., Fulton Foundry, Pittsburgh, Pa.,

Manufacturers of Rolls and Rolling Mill Machinery of every description, will receive prompt attention.

As convincing proof of their great superiority we refer to the following testimonials of practical men:

BELLAIRE, OHIO, Feb. 4, 1878.

We take pleasure in saying that we have used your Hollow Chill Rolls for 12 months, and find them to be the best chill Rolls we have ever used in our mill. The necks keep very much cooler and save grease and steam, and we can expand the body of Roll very much better than we can the solid Roll. We will order another pair as soon as we start our mill.

BELLAIRE NAIL WORKS,
A. L. WETHERAL, Manager.

BELLAIRE, O., Dec. 20, 1877.

I think your Rolls are just what you claim for them. The iron in them is fine and good, and the chill is even all over alike. They are the best for nail plate I ever worked. I can run a set of them three months without dressing, and make as good surface and good edges as you see on hoops, and they are ready to work fine iron at any time without change.

JAS. PATTERSON, Nail Plate Roller.

PITTSBURGH, April 9, 1878.

I have tried the Hollow Chill Rolls for sheet steel for twelve months, and believe them to be in every way superior to solid rolls. They keep their surface and produce handsome work. They do not heat in the necks. Your Solid Rolls on small mill for steel wire, &c., also give us great satisfaction, combining surface and strength. DAVID SHAW,
Manager for ANDERSON & PASSAVANT.

LA BELLE STEEL WORKS, April 10, 1878.

We have been using the Hollow Chill Rolls for a year, and are more pleased with them than the solid; have no hot necks or "springing" rolls, with less number of dressings, and are now free from cobweb checks or cracks on face we were so much troubled with in our solid rolls. SMITH, SUTTON & CO.

CRESCENT STEEL WORKS, Pittsburgh, April 11, 1878.

We have used several pairs of your Hollow Chill Rolls. One pair ran until we dressed all of the chill off; the others are still in use and doing well.

MILLER, METCALF & PARKIN.

CONSHOHOCKEN, PA., April 11, 1878.

In reply to your favor of 9th, we have to say that the Hollow Rolls made by you, and on which we are now making Sheet Iron, are giving good satisfaction. The work we are doing on these Rolls is of the very hardest kind, and tests rolls more severely than almost any other kind of work, making sheets Nos. 18 and 20, 5 to 9 feet long at one heat, from a bar 4½ in. wide. They are good hard surface, and even chill, and are still perfect after 6 months' use. We think these Rolls are superior to any we have now in use.

J. WOOD & BROS.,
Manufacturers Imitation Russia Sheet Iron, &c.

CATASAUQUA, PA., April 11, 1878.

The Hollow Chilled Plate Rolls received from you last summer have given us entire satisfaction, and if we were in need of Plate Rolls to-day we would order another pair just like the last. When we need pair you will hear from us. CATASAUQUA MFG. CO.
OLIVER WILLIAMS, General Manager.

PENNSYLVANIA IRON WORKS, PITTSBURGH, April 11, 1878.

It affords us pleasure to testify to the merits of your Hollow Chill Rolls, after constant use of them in our mills at Pittsburgh and Scottdale. The first one was put in one year ago, and we have taken particular notice of their behavior since that time. We say, as we have often said before, that we prefer them to any other rolls for their superior surface and general durability. We think they retain their "shape" better than solid rolls and keep cooler in the necks. We are at present using all Hollow Rolls, and when in need of more will, of course, order hollow ones.

EVERSON, MACRUM & CO.

RUSSIA SHEET MILL, Niles, O., April 13, 1878.

We have used your Hollow Chill Rolls in both our sheet mills for the past 12 months, and can confidently recommend them as strong, serviceable Rolls.

GEO. SUMMERS, Supt.

PITTSBURGH, April 17, 1878.

We have been using your Hollow Chill Rolls for several months, and so far they have given great satisfaction, and we see no reason why they should not continue to do so. We have kept a very careful watch so as to detect any defects in surface or other conditions, but have found nothing but what we can cheerfully commend. JOHN I. WILLIAMS,
(For Graff, Bennett & Co.)

PITTSBURGH, April 17th, 1878.

We have been using your Hollow Chill Rolls for nearly twelve months in our Universal Mill. We find that they do not expand out of shape in the body like solid rolls, and that we are consequently able to roll plates of more uniform thickness and with straighter and better edges. We consider them superior to solid rolls. JOHN G. MATTHEWS,
Manager at WILSON, WALKER & CO.

NEWPORT, KY., April 19, 1878.

After a thorough trial of your Hollow Chill Rolls on plates, sheets and wide fire bed, we have no hesitation in saying that they are the best Rolls we ever saw. They keep their surface, produce better finished iron, and do not get out of shape like solid Rolls. They have been thoroughly tested as to strength and are satisfactory in every respect. JOHN JORDON,
Manager SWIFT IRON AND STEEL WORKS.

PHILADELPHIA, April, 19.

The pair of Hollow Chill Rolls purchased from you we have been running for some time, and they give entire satisfaction. HENRY DISSTON & SONS.

PITTSBURGH, April 2, 1878.

The Rolls are now in the turning shop, undergoing the second dressing, and we can, without hesitation, state that having used a great number of chilled rolls for sheet steel rolling, we have never employed at our works a pair of rolls better in every respect than the pair referred to. Our sheet steel rolling is probably a much more severe test than your Rolls will be subject to at any other works. PARK, BROTHER & CO.

STORE TRUCKS,

With Steam-Bent Handles.

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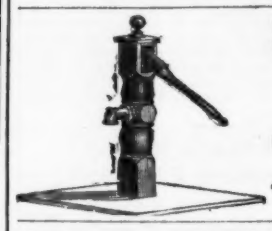

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Pig Iron, Storage & Commission.

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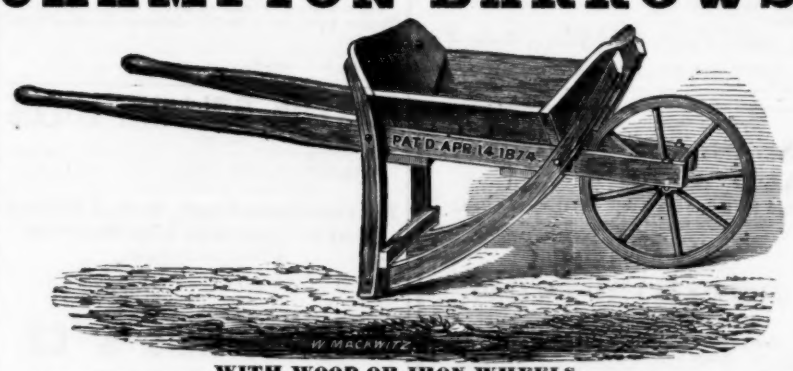

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Our agents, Graham & Haines, 113 Chambers St., New York, carry a full line of our goods, and will be pleased to serve you at Factory prices.

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Pittsburgh, Pa.,

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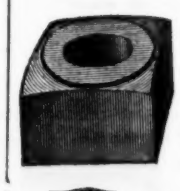

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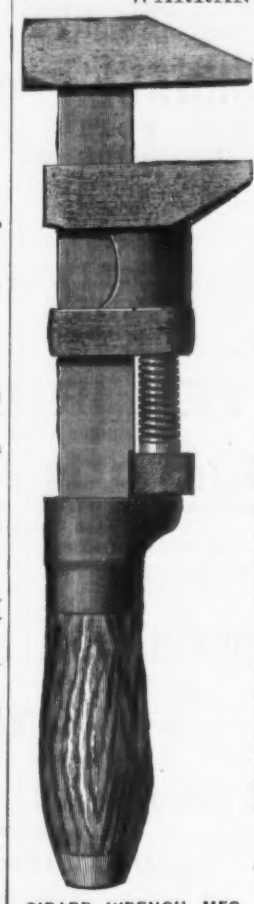

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Useful beside being

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Also all kinds of Press or Die work done cheaply, satisfactorily, promptly and well.

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The above Patent for sale for all States except New York and Pennsylvania.

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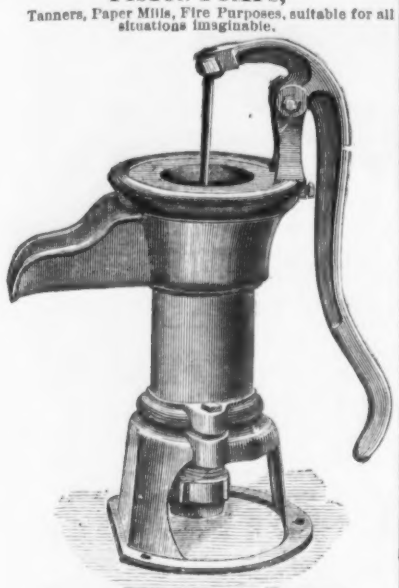

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S. DANA HAYES, State Assayer and Chemist, Boston, Mass.
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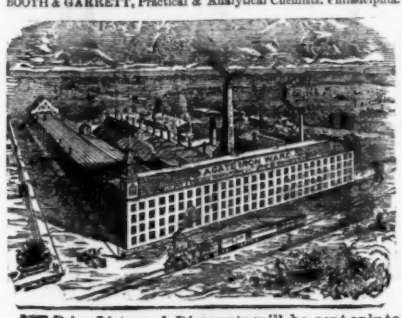
EDW'D. S. WOOD, Prof. Chem., Harvard Med. Coll., Boston, Mass.
WM. RIPLEY NICHOLS, Professor Gen. Chemistry, Boston, Mass.
BOOTH & GARRETT, Practical & Analytical Chemists, Philadelphia.



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Awarded the GRAND MEDAL of PROGRESS at WORLDS' EXPOSITION, VIENNA, 1873, being the highest awards on Pumps, &c., also, highest medal at PARIS in 1867, and Philadelphia, 1876, accompanied by Report of Judges.
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Manufacturers of all styles Plain and Ornamental Butts,
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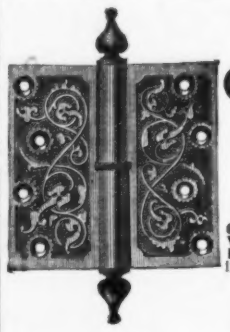
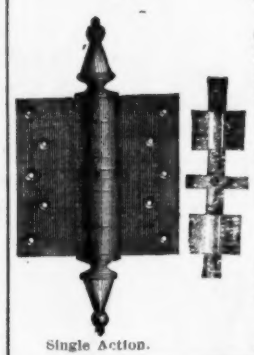


Centennial Spring Hinges.



This Hinge has **two** flat coil springs, very powerful It has a heavy **solid** pintal, giving much less friction than a **hollow** pintal. It has broad, solid bearings in the knuckle, which do not wear down readily and let the door sag. It is Fast Joint, therefore can be used for either right or left hand. By actual test it has an average of 50 per cent. more power than other Spring Hinges in common use of same size.
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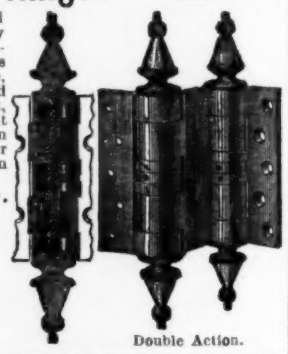
Send for Illustrated Catalogue Price List.



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4th. For their Economy in Construction.
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YALE LOCK MFG. CO.
OFFICE & WORKS:
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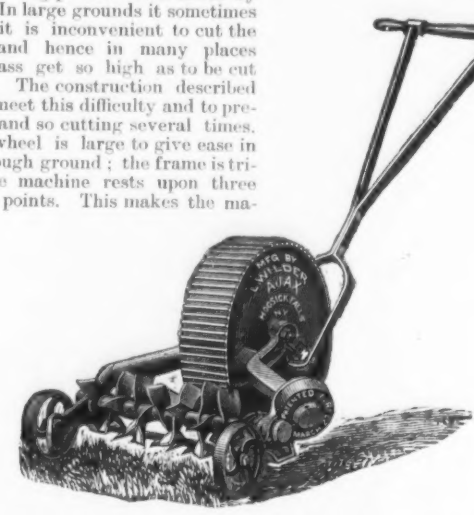
The Ajax Lawn Mower.

The Ajax Lawn Mower, manufactured by Mr. Lyman Wilder, of Hoosic Falls, N. Y., of which we give an illustration, has many points of novelty worthy of examination. Instead of a spiral knife revolving against a ledger plate the cutting is done by a series of spiral wipers or knives which operate against the ledger plate. The object of making the cutting portion of the machine in this way is to obviate any difficulty which might arise from tall grass being pushed down uncut by a spiral knife. In large grounds it sometimes happens that it is inconvenient to cut the grass often, and hence in many places weeds and grass get so high as to be cut with difficulty. The construction described is intended to meet this difficulty and to prevent crimping and so cutting several times. The driving wheel is large to give ease in passing over rough ground; the frame is triangular and the machine rests upon three equally distant points. This makes the machine easy to handle and steady at the same time. The gears are all boxed in to prevent the entrance of dirt or clogging from cut grass. Those who have used these machines say that grass can be cut with them when it is from 6 to 8 inches in hight.



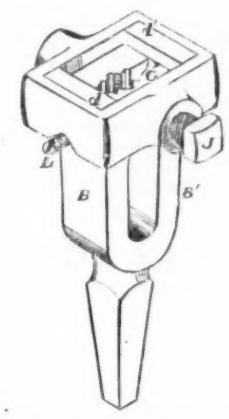
New Patents.

We take the following abstract of new patents, recently issued, from the official record:

SCREW-CUTTING DIE HOLDER.

To J. F. Brinckmann, Cincinnati, Ohio.—Jan. 22.—1. In a die wrench, the branches B B', provided at their extremities with shoulders *d d'*, in combination with the yoke, whose opposite upper inner edges are beveled to engage said shoulders, and screw L.

2. The die wrench composed of the branched stock A B B', provided with shoulders *d d'* and tongues E, and dies G, provided with grooves F and screw L, and the yoke provided with screw J.



SCREW DRIVER.

To J. B. West, Genesee, N. Y.—March 19.—1. In a screw driver, the combination, with the spiral shank B, of the rollers D D, provided with shafts *b b*, set obliquely and inclined upward to the threads of the shank.

2. In a screw driver, the combination, with the rollers D D, provided with the shafts *b b*, of the screws *p p*, inclosing the shafts, and serving to adjust said rollers in and out to fit the threads of the spiral shanks.

3. In a screw driver, the swiveled blade or driver E, constructed with the slots or notches *n n* in its top, and provided with a socket, in combination with the spiral shank B, constructed with lips *k k*, which strike into the slots, and provided with a stem, *h*, which enters the socket of the blade.

DIFFERENTIAL-PRESSURE REGULATOR.

To Samuel A. Hand, Philadelphia, Pa.—March 12.—The combination, in a pressure regulator, of a cylindical regulation chamber, two balance pistons fitted to and movable coincidently therein, a supply and a delivery pipe communicating with the regulating chamber between the balance pistons, a pipe or channel connecting the delivery pipe with the regulating chamber at one of the ends thereof, and a weight or spring by which pressure is applied to the balance pistons in reverse direction to that exerted by the fluid in the connecting pipe or channel.

The following trade-marks were registered during the week ending March 12:

5731.—*Steel Pens.*—Joseph Gillott & Sons, Birmingham, England, and New York, N. Y.
"The number '604.'"

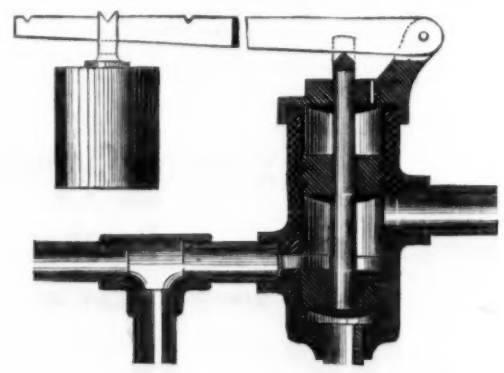
5732.—*Steel Pens.*—Joseph Gillott & Sons, Birmingham, England, and New York, N. Y.
"The number '322.'"

5733.—*Steel Pens.*—Joseph Gillott & Sons, Birmingham, England, and New York, N. Y.
"The number '351.'"

5734.—*Steel Pens.*—Joseph Gillott & Sons, Birmingham, England, and New York, N. Y.
"The number '170.'"

Mr. F. C. Glaser, in the *Annalen d. Gewerbe and Bauwesen*, of which he is editor, announces the commencement of an exhaustive study of the comparative qualities of Rhenish, Westphalian and imported foundry pig iron, which is being undertaken with the help of the principal blast furnace owners, under the control of M. Wachler, of Gleiwitz, and M. Scheffer, of Sterkrade. The chemical analysis will be conducted in the laboratory of the Mining Academy of Berlin, by Prof. Finkener. The testing is being carried on at the Union Works at Essen.

The Detroit *Free Press* gives an account of the working of the telephone during the burning out of its building. The telephone in the editorial rooms communicated with the residence of the managing editor, a mile and a half away. When the fire attacked the editorial rooms, the bell at the residence began to ring violently. As the fire increased in intensity the ringing of the bell became more impetuous, pealing in gusts as the fire seemed to surge around the companion bell in the burning building. It was an embodiment of Poe's lines on "The Bells," where the rising and the quelling of the fire could be calculated by the rising and the falling of the anger of the bells. At last the clamor of the telephone bell became unbearable to those in the room and the bell was muffled with cotton, which partly stopped the alarm. But here the strangest part of the telephone's action comes in. From the speaking tube came the roar of the fire, and it would seem that the swish of the water from the engine, and the pouring of the floods from the roof could be plainly heard. The crackling of the burning timbers, and at last the crash of floors and falling partitions came, and every sound of the conflagration in all its inflections was faithfully reproduced. The sudden stoppage of all sound showed that communication was broken and the voice of the wonderful instrument stilled by the scorching flames.



Milwaukee gas lamps are to be lighted this year at $15.75 per lamp; sprinkling its streets will cost 5⅜ cents to 8½ cents.

USE THE BEST.

NEW

AMERICAN FILE COMPANY.

THE NEW AMERICAN FILE COMPANY have the exclusive right to use the Bernot process for cutting Files. By this method all the advantages of hand cutting are secured, together with an accuracy unattainable in hand work. They are the only manufacturers who employ machinery for testing Files and Steel.

NEW AMERICAN FILE CO., Pawtucket, R. I.

AUBURN FILE WORKS,

Superior Hand-Cut

FILES AND RASPS,

MADE FROM IMPORTED STEEL. EVERY FILE WARRANTED.

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Granted for

After more than Fifteen Years of Competition

McCaffrey's Philadelphia Hand Cut Files and Rasps

Have Proved their Great Superiority.

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Prof. A. L. LOOMIS, M. D., University of City of New York, writes as follows:

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Rubber supplied with enlarged edge and instructions to enable Car Manufacturers, Carpenters, Builders and far off trade to make slots in Sashes, Doors, Moldings, &c., and thus make perfect Weather Strips.

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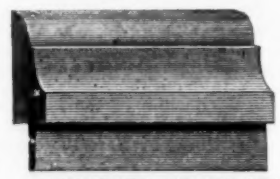

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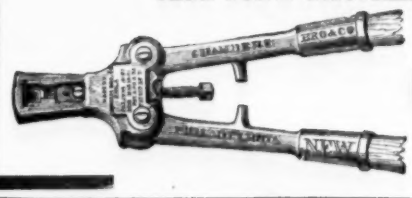

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Cylinders adjustable for doors from 1¼ inch to 2 inches.

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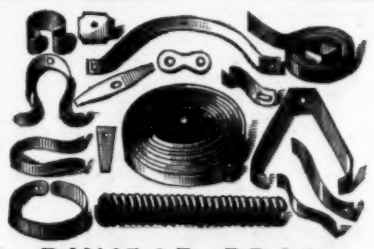

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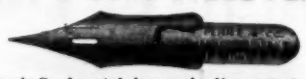

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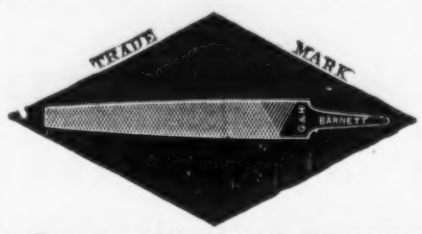

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All descriptions of Files made to order. Price List mailed on application. Established 1863.

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ALL CUT BY HAND,

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And made of the best American Steel, which have been pronounced unequaled in the market by all experts who have been using them for the last fourteen years, and which are now almost exclusively used in all the principal cities of the United States.

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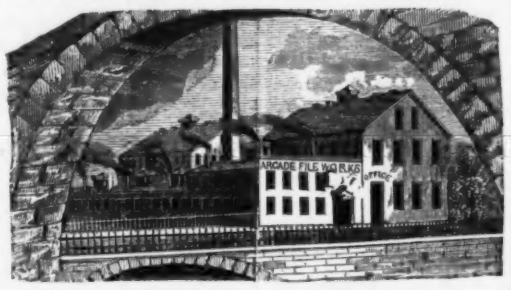

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Quality guaranteed by written warranty when required.

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POLISHED OR BLUED.

HAMMERED AND FINISHED

The Ausable Nails

Are Hammered Hot,

And the Finishing and Pointing are Done Cold,

Thus Imitating the Process of Making Nails by Hand.

Quality is **Fully Guaranteed.**

For Sale by all Leading Iron and Hardware Houses.

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Shoe Nails, Fine Two Penny and Three Penny Nails, Channel, Cigar Box and Chair Nails, Leathered Carpet Tacks, Glaziers' Points, Etc.

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☞ Any variations from the regular size or shape of the above-named goods made from samples to order. ☜

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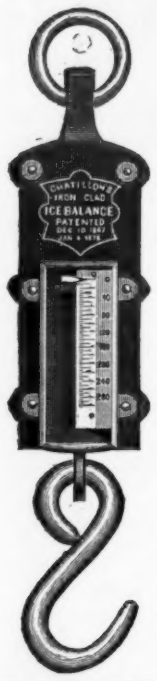

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For all purposes for which Tape Measures are required.

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FINE TEMPERED STEEL SPRINGS.

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From ¼ inch wide upward. Warranted tougher than any other **Band Saw.** Catalogues on application

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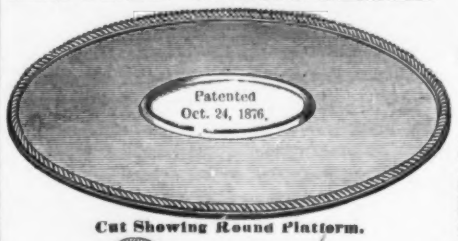
162 & 164 West 27th Street, N. Y.

ANSONIA CORRUGATED STOVE PLATFORM



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The Ansonia Corrugated Stove Platform, with its heavy figured ogee border, is believed to be the best Platform offered to the trade. As shown in the illustrated section herewith it requires no nailing to keep it in place or to prevent it from turning up at the edge; while the metal is of sufficient thickness to require no lining.

The low price, superior quality and fine finish of this Platform will be readily acknowledged. Packed 24 in a case.

Send for price list.

ANSONIA Bronzed Fire Screen,

With Ornamented Mouldings.

PATENT APPLIED FOR.

The Portable Bronzed Fire Screen or Shield, as shown in the illustration, is especially designed for the safety and protection of walls, furniture, woodwork, paper or varnish from heat.

Being constructed of metal, with firm and substantial edges, curved in form to stand alone, it may be easily adjusted to any position about a stove, before a grate or fire place. The demand for something useful, durable and ornamental as a Fire Screen has long been felt, and having finally accomplished the desired result, we are prepared to fill all orders promptly.

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THE AMERICAN STANDARD WIRE GAUGE,

Bevel Protectors, Hardened T Squares and Bevels, Center Gauges, Steel, German Silver & Boxwood Triangular Scales, Vernier Calipers, Caliper Squares and Rules, Plumb Bobs,

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MEDALS AWARDED: Paris Exposition, 1867; Vienna Exposition, 1873; Philadelphia, 1876. ☜

Illustrated Catalogue sent per mail on application.

On the Estimation of Phosphorus in Iron and Steel.

Mr. Edward Riley, one of the most prominent chemists of England, has communicated to the Chemical Society the results of some experiments made to ascertain the comparative value of the molybdate and the magnesia method of estimating phosphorus in iron and steel, from which we take the following:

The accurate determination of the amount of phosphorus present in iron and steel, more especially since the introduction of the Bessemer and Siemens-Martin processes, now so largely used, has become of the greatest technical importance.

The method most generally employed at iron and steel works is that known as the molybdate method, the other is known as the magnesia method; the latter is not so much used, as the results cannot be obtained so quickly.

The percentage of phosphorus is as a rule so small in the pig iron used and the steel made that to determine it accurately requires much practice and some amount of analytical skill.

Often the estimations are too low, or no phosphorus is detected at all, which, in the case of the molybdate method, is due to having the solution too acid, or in other cases not adding a sufficient amount of molybdate solution. In the case of high estimates, which are not unfrequent, the excess is due to molybdic acid being thrown down together with the phosphorus precipitate.

The great importance of the accurate determination of phosphorus induced me to have a series of experiments made by various operators, so as to ascertain how nearly the practical results obtained in iron and steel works, and in various metallurgical laboratories, actually agreed with the absolute amount of phosphorus present.

For this purpose pure peroxide of iron was prepared, by dissolving ordinary iron filings in sulphuric acid, crystallizing the sulphate and purifying it by recrystallization, and precipitating with ammonia. This peroxide was examined and was found to contain .0018 per cent. of phosphorus. Some pure $Mg_2P_2O_7$ was also made by adding phosphate of soda to magnesia solution (made by adding a considerable amount of ammonia and chloride of ammonium to a saturated solution of ordinary sulphate of magnesia and filtering).

In carrying out the experiments, each of my assistants ignited from 213 grams to 218 grams of the pure peroxide of iron, this quantity representing about 150 grams of metallic iron, the usual quantity taken for phosphorus determinations in steel.

The above quantity was dissolved in strong hydrochloric acid. I then very carefully myself weighed out the phosphorus salt, giving each a different quantity. The solution of the peroxide was poured on the magnesium phosphate in a small beaker and warmed until it was completely dissolved.

The phosphorus was then determined by my ordinary method, each assistant working on a solution of iron containing a quantity of phosphorus unknown to him.

The following are the results that were obtained by each:

	Peroxide iron taken.	$Mg_2P_2O_7$ added.	$Mg_2P_2O_7$ found.	$Mg_2P_2O_7$ reprecip'd
I. W. H. Herdsman	218.62	.46	.475	.460
II. A. E. Tucker	213.45	.48	.500	.500
III. G. A. Jarvis	215.26	.35	.380	.365
IV. F. J. Bolt	214.255	.72	.775	.745
V. A. L. Hughes	215.215	.71	.725	....

Converting the peroxide of iron into metallic iron and calculating the percentage of phosphorus present in the iron (after deducting the small amount of phosphorus found in the peroxide), the results are as follows:

Per'de of iron to met'lic iron.	Phos. p. c. added.	Phos. p. c. found.	Difference p. c. in phos.
I.	153.034	.0839	.0840	.0001
II.	149.415	.0897	.0908	.0011
III.	150.682	.0648	.0678	.0030
IV.	149.978	.1340	.1417	.0077
V.	150.650	.1316	.1336	.0080

or a mean error in excess of .0028 per cent.

In all cases the calculation is made on the first precipitation and weighing of the magnesium phosphate.

The first four, as my assistants, have had considerable practice in determining phosphorus. No. 5 determination was made by one of my pupils who has had but little practice, not having made more than three or four determinations of phosphorus in iron and steel. The above were the only experiments made, and it will be seen that practically the exact amount of phosphorus was obtained that I weighed in.

In reprecipitating the $Mg_2P_2O_7$ after weighing, it was dissolved in strong hydrochloric acid, a very small crystal of citric acid added, and excess of ammonia; and the precipitate after standing for two nights was filtered and weighed as before.

An experiment was made on some of the phosphate of magnesia to see what was the actual loss on reprecipitation.

$Mg_2P_2O_7$.	Ignited over Bunsen burner.	Ignited in muffle.
2.46 gave	2.445*	2.42

The experiment was made with the same bulk of liquid as in an ordinary phosphorus determination, and in precisely the same way, except that no citric acid or magnesia salt was added.

I should perhaps mention that when there is much phosphorus present, as in ordinary pig iron (not Bessemer pig), I operate on smaller quantities, and if there is much precipitate I use a rather larger bulk of liquid.

From the above experiment, and also from the results obtained in the previous experiments, it will be seen, as I have always found it, that there is no appreciable loss on reprecipitating the $Mg_2P_2O_7$, thus proving the practical purity of the precipitate obtained on the first precipitation.

In order to compare the results obtained by the molybdate method, 1000 grains of the Fe_2O_3, weighed after ignition, were dissolved in hydrochloric acid; and to this 2.496 grams of ignited $Mg_2P_2O_7$ were added; after solution the whole was reprecipitated by ammonia, washed with distilled water, dried, ignited and weighed.

The above quantity of magnesia salt represents in the iron calculated from the Fe^2O_3:

Phosphorus, per cent	.0994
Phosphorus in iron	.0026
Total	.1020

* Not quite white.

This gives the actual quantity of phosphorus present. To be quite certain that no mistake was made, Mr. Herdsman determined the phosphorus by the magnesia method.

Grams of Fe_2O_3.	$Mg_2P_2O_7$.	Phosphorus per cent. in iron.
213.27 gave	.52 equal	.0972
or difference	—	.0048

Various portions, from 80 to 150 grains, were sent to three of the largest steel works in the country, where phosphorus determinations are made daily, by some of our most expert analysts of iron and steel; two other portions were sent, one to a well-known chemist with a very large experience in iron and steel analysis, and another to a chemist also with a large experience, but not so well known.

The following are the results returned:

Phosphorus per cent. by Molybdate Method.

I.	Phosphorus per cent	.0780	
II.	" "	.0749, .0821	Mean. .0785
III.	" "	.0640	
IV.	" "	.0700	
V.	" "	.0760	

The mean of the five results is:

Phosphorus per cent	.0733
Error in determinations per cent	.0087

All the results are very concordant, except perhaps No. 3, and all low, thus showing that phosphorus determinations as now carried out by our best operators are too low.

The phosphorus was determined three times in a rail from the Sheffield Steel Works:

A.	150 grains of steel gave phosphorus per cent	.094
B.	200 " " " "	.090
C.	150 " " " "	.096

All the analyses were made by different operators.

The molybdate gave, analyses made at Steel Works:

A.	Phosphorus per cent	.0602, .0586	.0597
B.	" "	.076	
C.	" "	.076, .086	.081
	Mean by magnesia method		.0933
	Mean by molybdate		.0722
	Difference		.0211

thus showing a difference between the results very closely approximating the difference in the previous case.

Take another case of same sample bars of steel.

Two of my assistants (one now at a steel works) made:

		I. Magnesia method.	II. Magnesia method.
A	Phosphorus per cent	.172	.180
B	" "	.162	.164
B'	Repeated by same operator	.165	.170
		Molybdate method.	
C	Chemist at Sheffield Steel Works returned	.267	.273

This high result differing so much from the above, the analyses were repeated, and the following results sent by same chemist:

		Molybdate method.	
C'	Phosphorus per cent	.142	.166
C''	" "	.154	.154
D	Another iron works chemist	.145	.158

thus clearly showing that the magnesia results are always higher.

I have had a very lengthy correspondence with chemists who have had considerable experience in the determination of phosphorus, mostly with chemists at iron and steel works. The opinion of several is that the two methods may be made to give the same results. This I think is quite possible, as the magnesia process may readily be worked to give slightly lower results.

In the case of the molybdate method, I find frequently that duplicate analyses are made on the same quantity of steel. Now it is quite possible that corresponding results may be obtained, and that they may be quite wrong, as I regard this as no check on an analysis. The better way is to take twice the quantity in one case to that taken in the other.

Before instituting the above experiments, I have most thoroughly tested the magnesia method, and had every confidence in its accuracy when carefully performed. I have used five times as much steel in one case as another, and obtained corresponding results, and numerous cases double, treble and so on.

The experiments given, made by so many different operators, clearly show, I think, that as the molybdate process is now carried out the results are too low.

The method is, however, much more rapid than the magnesia process, and from experiments I have made I think the molybdate process may be improved.

The method I propose is to dissolve the steel or iron in 1.20 nitric acid, avoiding as much excess as possible; to the solution, diluted to rather more than half a pint, sodium sulphite is added, so as to reduce the iron to FeO after boiling off the sulphite (a large excess should be avoided); the phosphorus is precipitated with some peroxide as basic acetate and phosphate, precisely as in the magnesia method; the precipitate is dissolved in hydrochloric acid; the solution made alkaline with ammonia; and the precipitate formed dissolved in 1.40 nitric acid. The solution is then precipitated with molybdate of ammonia in the ordinary way.

In an experiment made by Mr. Herdsman it was found that the phospho-molybdate came down at once; in 20 minutes the precipitate had settled; and in less than an hour after adding the molybdate, the liquid was filtered, and the precipitate ready to dry. The result obtained was phosphorus .077 per cent. in a steel rail containing by the magnesia method .093; it was found that some precipitate of phospho-molybdate was formed on heating the filtrate.

Although this experiment was not successful, still I am inclined to think that by allowing a little more time, and with more practice, it may be made to succeed, and to give results more accurate than the ordinary process, and in about the same time. I propose carrying out a series of experiments in this direction.

Gallium is a hard and malleable metal; it takes under the hammer the polish of the anvil, but rapidly grows harder and brittle, and is then liable to fly to pieces. In spite of its relatively considerable hardness, gallium leaves on paper strongly-defined marks of a bluish-gray color. It retains its luster in the atmosphere of a laboratory constantly loaded with acid vapors, and undergoes no alteration in appearance in boiled water In aerated water it tarnishes slightly.

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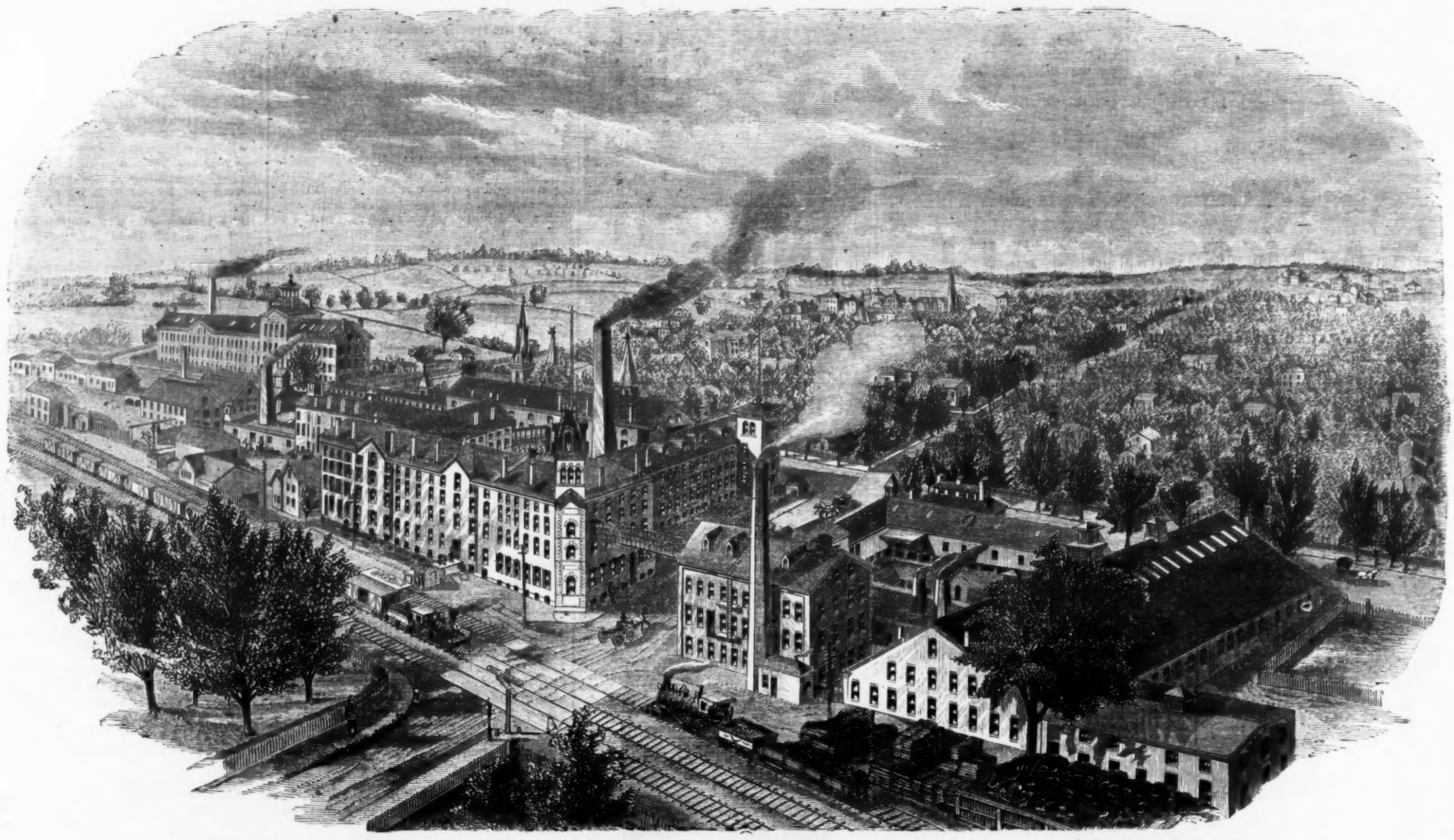

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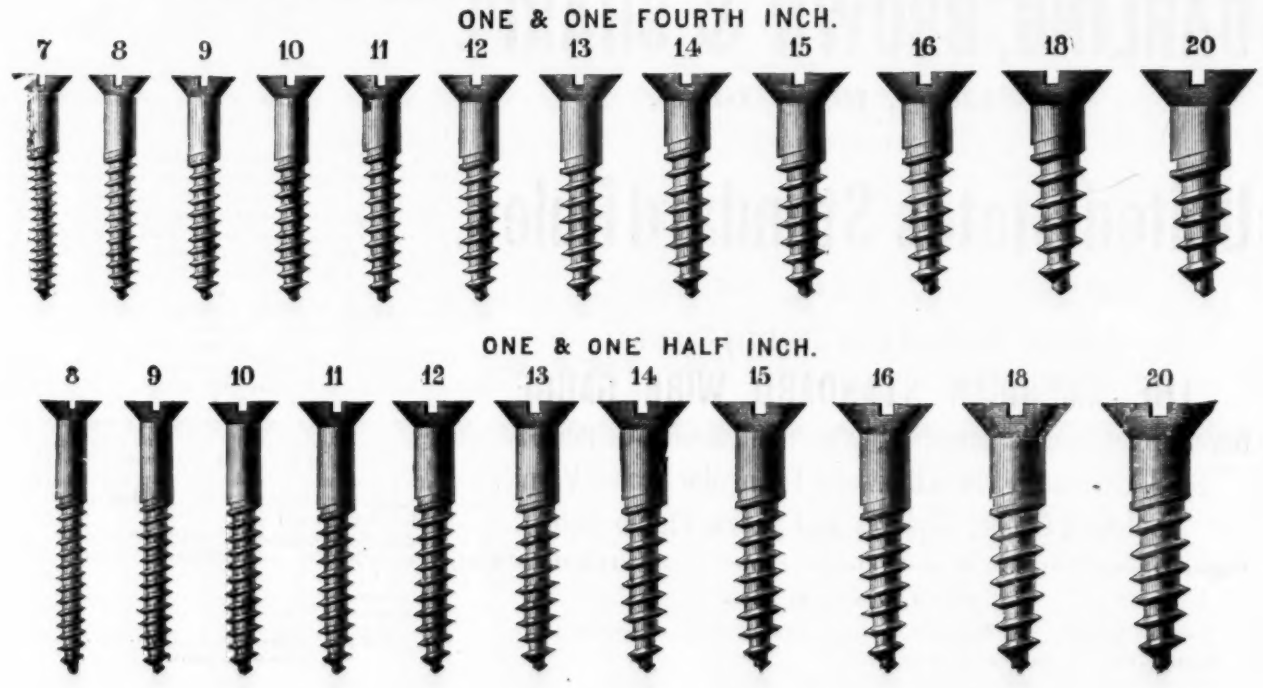
Round Head Nickel-Plated.
Flat Head Bronzed.



Cutlery.

FRIEDMANN & LAUTERJUNG,

Manufacturers of **PEN AND POCKET CUTLERY,**

Solid Steel Scissors, Shears, Razors, Russia Leather Strops, Hones, &c.

Sole proprietors of the renowned full concave patent

"ELECTRIC RAZORS,"

And the celebrated **"ELECTRIC SHEARS."** Nickel Plated Bows.

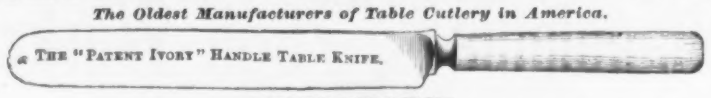
Agents for the BENGALL RAZORS.

AMERICAN TABLE CUTLERY, BUTCHER KNIVES, &c.

91 Chambers and 73 Reade Sts., N. Y. 423 N. Fifth St., ST. LOUIS, MO.

MERIDEN CUTLERY CO.

The Oldest Manufacturers of Table Cutlery in America.



THE "PATENT IVORY" HANDLE TABLE KNIFE.

EXCLUSIVE MAKERS OF THE

CELLULOID

HANDLE FOR TABLE CUTLERY. A most beautiful and perfect substitute for Ivory. Also makers of all kinds of **TABLE, BUTCHER AND HUNTING KNIVES.**

Illustrated catalogues with prices sent to the trade on application. 49 Chambers St., New York.

THE LAMSON & GOODNOW MFG. CO.

NAUGATUCK CUTLERY CO.,

Manufacturers of FINE PEN & POCKET CUTLERY.

FULLER BROS., Sole Agents, 89 Chambers and 71 Reade Sts., N. Y.

H. WILKINSON'S

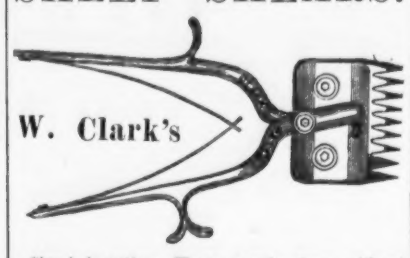
PATENT TRIANGULAR HANDLE SCREW DRIVER.

This Triangular Head fits naturally to the grasp of the hand, and affords to the user the strongest possible grip, as any one can satisfy himself by trial. Three turns of the wrist—the part of the arm above the elbow remaining stationary—make one complete circle, so that a single twist of the wrist just suffices to shift the grasp from point to point.

H. WILKINSON, Manufacturer of Original "Wilkinson" Goods, **Collinsville, Conn.**

Cutlery.

SHEEP SHEARS.



Simple in action. Fleece evenly shorn without injuring the skin. Is held firmly in right hand and easily operated. Also

CLARK'S HORSE CLIPPERS.

No. 1 for two hands; No. 2, one hand, for heads and manes; No. 3, one hand, for legs and coarse hair; No. 4, for two hands, with improved spring. Send for price list.

McCOY & CO.,

SOLE AGENTS,

134 and 136 Duane Street, New York.

Cutlery.

JOSEPH S. FISHER,

No. 411 Commerce St., PHILADELPHIA

AGENT FOR

George Wostenholm & Son,

"Limited."

Washington Works, SHEFFIELD,

Celebrated I-XL Cutlery, Razors, &c

AGENT FOR

WALTER SPENCER & CO.,

Steel and File Manufacturers,

Rotherham, ENGLAND.

Corporate Mark.

SPENCER ROTHERHAM

Granted 1777.

HERMANN BOKER & CO.,

101 & 103 Duane Street, New York,

SOLE AGENTS FOR THE

GARDNER PATENT

POCKET KNIVES

The assortment of Gardner's Celebrated Barlow Knives has been increased, and they are now furnished with Rubber, Bone, Stag and Wrought Iron Handles.

All of Gardner's Patent Knives are fully warranted.

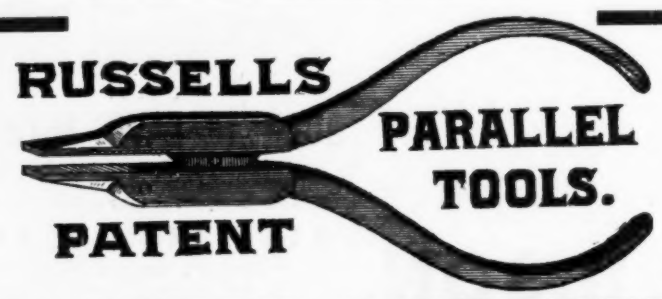
ESTABLISHED 1853.

AARON BURKINSHAW,

Manufacturer of **Pen and Pocket Cutlery,** Pepperell, Mass.

My Blades are forged by hand from the best Cast Steel, and warranted. To me was awarded the Gold Medal of the Conn. State Agricultural Society.

RUSSELLS PARALLEL PATENT TOOLS.



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Sole Manufacturers and Proprietors.

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Electro Plated Ware, German Silver and Britannia Spoons.

THE "ORLEANS."

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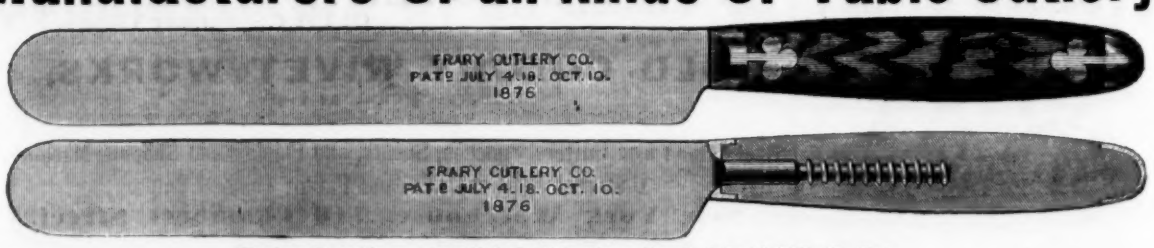
THE FRARY CUTLERY COMPANY,

FACTORY, BRIDGEPORT, CONN.

NEW YORK OFFICE & WAREHOUSE, with WIEBUSCH & HILGER HARDWARE CO., 84 Chambers St.

Manufacturers of all kinds of Table Cutlery.



The above Illustrations represent their New Patent Screw Tang Lock Fast Solid Handle Knife.

There is no question but that a solid handle Knife is much more preferable than a scale tang. The great objection to their use hitherto is, that no solid wood handle has been placed on the market with the handle properly secured—no handle put on with cement will stand the wear and tear of every day usage. The cement will expand and contract with the action of heat and cold, and become loose, crack and come off, causing great prejudice against their use. This objection is overcome in our patent screw tang. A wood screw is welded to the tang of the Knife or Fork, and screwed firmly and securely in the handle and locked there by the bolster, making a very strong neat and handsome knife, which we warrant never to get loose, crack or come off. We manufacture a large variety of patterns, both Table, Butchers and Carvers, and furnish the patent handle nearly as low as the scale tang. We are prepared to furnish this line of goods, together with the scale tang and iron handle, very promptly, and very respectfully invite the attention of the trade.

CLOTHES WRINGER!

Steel Elliptic Spring. Self-Adjusting

T. J. ALEXANDER, Manager,

BOSTON, MASS.

BUCK BROS, Millbury, Mass.

The most complete assortment in the U. S. of **Shank, Socket Firmer and Socket Framing Chisels,**

PLANE IRONS.

Gouges of all lengths and circles, beveled inside or outside. Nail sets, Scratch and Belt Awls, Chisel Handles of all kinds. Orders filled promptly; generally same day as received.

CORPORATE MARK.

Joseph Rodgers & Sons'

(LIMITED)

CELEBRATED CUTLERY,

No. 82 Chambers Street, New York.

F. & W. CLATWORTHY, Agents.

The demand for **Joseph Rodgers & Sons'** productions having considerably increased, they have, in order to meet it, greatly extended their Manufacturing Premises and Steam power.

To distinguish Articles of **Joseph Rodgers & Sons'** Manufacture, please to see that they bear their Corporate Mark.

ESTABLISHED 1852.

NEW YORK KNIFE CO.

MANUFACTURERS OF SUPERIOR

Table & Pocket Cutlery,

WARRANTED TO BE MADE OF THE BEST MATERIAL.

WALKILL RIVER WORKS,

Walden, Orange Co., New York.

THOS. J. BRADLEY, President.

ALFRED H. HILDICK,

12 Warren St., N. Y., Importer of

Birmingham Heavy Hardware, Chains, Anvils, Vises, &c.

Agency of HILL BROS. & CO., WALSALL, ENGLAND GENERAL HARDWARE MERCHANTS,

And of

Ball's Pat. Solid Steel Sheep Shears.

These Shears are unsurpassed for cheapness, durability and utility. They are made of one solid piece of steel from point to point, and cannot be broken in use, either in the bow or at the junction of shank and blade. Samples can be seen at above address, or sample lots furnished. Depot for "THE CROWN" SOLID BOX VISES. A cheap and excellent Vise.

L. SOLOMON,

Commission Merchant

IN

House Furnishing Goods.

Agent for the

Champion & Knox No. 99 Fluting Machines,

EUREKA & PEERLESS WRINGERS.

100 Chambers St., New York.

A Model Iron Freight Steamer.

The arrival in New York Harbor of the new iron steamship Powhatan, pioneer of Phelps Bros.'s new line to the Mediterranean, excites more remark among shipmasters and underwriters than ordinarily attends such an accession to the merchant marine. She is probably one of the best constructed and most complete exclusively freighting steamers afloat, combining the qualities of economy, speed and capacity. She may almost be claimed as an American steamer, Messrs. Phelps Bros., of Front street, in this city (who lead in the Mediterranean fruit trade, but until now have chartered all their vessels), being her principal owners. Moreover, she is the product of American enterprise—the first of a number of new steamers in contemplation especially designed for the Mediterranean fruit trade. She rates in Lloyd's "100 A1," the highest class. Her builders are Thomas Royden & Son, of Liverpool. The cost of building the Powhatan was about $160,000. Her length is 267 feet; breadth of beam, 32 feet; depth of hold, 23 feet, and she registers 998 tons. She has a pair of compound direct-acting engines, and surface condensers. Her cylinders are 64 and 32 inches in diameter respectively, with 39 inches stroke. Her plating is all half inch iron, and her main deck is of iron planked over. Her model is very sharp, in striking contrast with the full round bows of freighting ships formerly built. This vessel is probably open to criticism on account of the superfluous weight of iron used in her construction, detracting needlessly from her carrying capacity without any corresponding increase of strength, but this fault, if it really exists, is easily rectified in the future.

The most striking feature is the manner in which all the arrangements of whatever kind are subordinated to the single idea of securing cargo space. In going through the vessel we were struck with the broad sweep of her ample 'tween decks, scarcely broken by a single object. But for the smoke stack and engine room, even the machinery might have been passed by unnoticed. The iron hatch combings are built waist-high, to protect the cargo from the wash of heavy seas. Besides other provisions for the free circulation of air, even in rough weather, there are two ventilators, about a foot in diameter, of plate iron, rising 13 feet perpendicularly from the deck. The officers quarters, cook's galley, &c., are all located on deck in a sort of "amidships poop," with a round top and fore and aft bulkheads, all of iron. The speed of this steamer was calculated in her construction at 10 knots an hour, but in her initial voyage just made she attained a speed of 11 knots under steam alone, and 12½ knots under steam and sail. Her average from Gibraltar was 10 knots. The consumption of coal is 12 tons for 24 hours, her fuel costing in Liverpool 10/6 per ton. The route and running time are given in the log book as follows:

	No. days.
From Liverpool to Palermo	11½
From Palermo to Valencia	2½
From Valencia to Gibraltar	1½
From Gibraltar to New York	14

The Powhatan discharged 1600 tons of coal at Palermo, filling up with fruit there and at Valencia.

The total running expenses of this steamer have been carefully calculated at £30 per day, wages, coal, provisions, wear and tear, oil, insurance—all included. The crew consists of 26 men, all told, of whom sailors receive £3. 10/ per month; firemen, £4. The full complement is made up as follows: Three officers, 3 engineers, 6 seamen, steward, second steward, boatswain, carpenter, cook, donkeyman and 8 firemen. English captains are understood to receive usually about $1200 per annum. As regards provisions, one of the officers remarks, "plenty of work and plenty to eat."*

"Why," it may be asked, "were the steamers of the New York and Mediterranean Steamship Company, essentially American in their ownership, given to English shipbuilders rather than our own?" The reply is made by a gentleman largely interested, who, while admitting that iron steamers may be built as cheaply and as well on the Delaware as on the Clyde, says the ratings of the marine insurance companies do not yet show this to be a fact, and to rate well at Lloyd's is a consideration which goes far to determine where ships shall be built. However this may be, some of the most experienced American shipmasters who remember more palmy days, declare that the question as to the comparative cheapness of American and foreign bottoms has ceased to be an issue; that the cost of navigating American ships is the vital point now to be settled. Italians engage their crews at $15 per month, the men feeding themselves; while Norwegians get little more. Obviously, American sailors cannot well compete under such odds. It is affirmed that Italians can sail a ship one-half cheaper than Americans; Norwegians, one-third; Germans, one-quarter, and British, one-eighth. The first two mentioned are our strongest competitors in the matter of wages, and this year, the Black sea being closed against them, they crowd into American ports in greater numbers than ever, usually loading with small cargoes of grain for by-ports in Europe, or petroleum in cases for the Mediterranean. Are Americans able to conform to the conditions, and not only build ships but sail them at a low cost? Will they discern the wisdom of building exclusively freighting ships like the Powhatan, meanwhile watching for the opportunity to build steamers which, in point of construction and appliances, shall excel the finest now engaged in carrying passengers. Clearly enough such a course may be advisable, rather than to adopt the extreme free-trade theories of certain enthusiasts in this matter, who would rush in to buy up the 300 discarded steamers which await sale in British ports, by this process furnishing means to our maritime rivals wherewith to lay new keels and compete more fiercely than ever for the mastery of the seas. What say the alleged British lobby at Washington?

* We shall next hear of the Powhatan as loading with grain for England, thus making a triangular voyage all the way with full cargoes, and all in eleven weeks. Sailing at no high cost, she must make money.

S. H. & E. Y. MOORE,

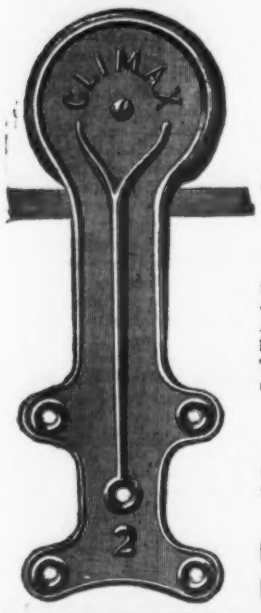
68 Lake Street, CHICAGO, ILL.,

Heavy Hardware & Railway Supplies.

AGENTS FOR

Providence Tool Co., Reading Bolt & Nut Works, Syracuse Bolt Co.,

And Other Manufacturers.



MANUFACTURERS OF

CLIMAX BARN DOOR HANGERS,

MOORE'S

Anti-Friction Sliding Door Sheaves,

"Folant" Barn Door Catches,

&c., &c.

The "Climax" is recognized as the **Leading Hanger** in the market. It is **altogether superior** to any other Barn Door Hanger ever made. In the "Climax" is a **complete wheel** provided with Anti-Friction Bearings. It is practical, hence its widespread popularity. It is the **only** Anti-Friction **Hanger having a Wheel.** The trade are cautioned against imitations, made to sell, and which are without any mechanical principles to recommend them.

Moore's Anti-Friction Hay Fork Pulley.

The main wheel contains four anti-friction wheels which revolve upon axles fast in its sides. The main wheel revolves nine times while the anti-friction wheels are revolving once.

Depot for goods of our manufacture:

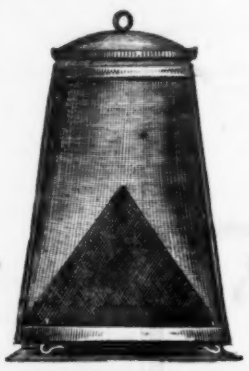
FERNALD & SISE, 100 Chambers Street, New York.
E. & C. GURNEY & CO., Hamilton, Canada.

PARAGON FLY TRAP.

The Quickest Selling Trap in the Market.

—

Larger than other Cone Traps.



PRICE, per single dozen, $3·00.

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Special Prices in Quantity Lots.

Prices the Lowest in the Market.

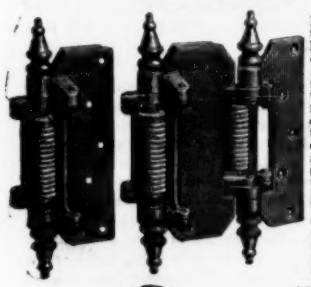
TENNIS & WILSON,

81 Beekman Street, New York.

The Cowles Hardware Co., Unionville, Conn.,

MANUFACTURERS OF

Geer's Double and Single Action Spring Butts.



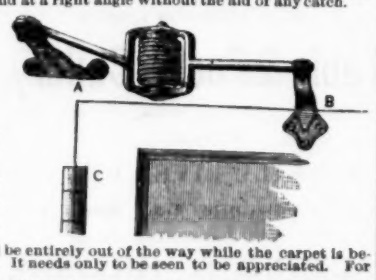
Reverse in action and radically different from any other in market. Patented July 17, 1877. The accompanying cut shows our Double Action Spring Butts for swinging doors both ways. We claim the following points of superiority: *First.*—These Butts differ from all others in principle and action, combining the *Toggle Arm with the Spiral Spring*, which by actual test gives out from 60 to 80 per cent. *more force* at the *closing point* than when opened to a right angle, thus holding the door firmly in place, and not allowing it to be moved by currents of air. *Second.*—*They will allow the door to be opened clear back to the wall*, and the spring retains it there; thus the toggle and spring fill two important offices—that of holding the door closed and also open. *Third.*—It is impossible to strain the spring, as there is not more than 60 per cent. of the elasticity of it used in swinging the door back to the wall, therefore it will not become weak from constant use. *Fourth.*—The bearings are all faced with hardened steel, which is much superior to common cast iron or brass, both in regard to friction anddurability. *Fifth.*—They will hold the door firmly up to its place on the top, and not allow it to open off, thus obviating all tendency to sag. *Sixth.*—These Butts are so constructed that there is no right or left hand. When adjusted to the door they *never need taking up* or *letting out*, as they are perfectly adapted for either summer or winter, without any change whatever.

HERCULES

Reverse Action Door Spring and Retainer.

(Patented March 4, 1873.)

On an entirely new principle, distinct from all others. Holds the door open as well as shut, and allows the door to stand at a right angle without the aid of any catch.



BULLARD'S PAT. CARPET STRETCHER.

Patented June 13th, 1876.

The best thing ever made for laying carpets. It is light, simple in construction, durable and not expensive, is very easy to operate, and is warranted not to injure the finest carpet. It holds the carpet in position after it is drawn to its proper place, thus giving the operator the free use of both hands with which to do the nailing. The lever, E, is then folded back and down upon the push bar, A, so it will be entirely out of the way while the carpet is being nailed. No person using one once will be without one. It needs only to be seen to be appreciated. For utility it defies competition.

Also manufacturers of Awls, Bung Starts, Butter Spuds, Bill Hooks, Brush Hooks, Butts (Double Spring and Single Spring), Border Knives, Box Openers, Box Hooks, Box Scrapers, Cleavers (Cast Steel), Cake Turners, Corn Hooks, Cover Lifters, Cold Chisels, Carriage Jacks, Carpet Stretchers (Bullard's and Common), Door Springs (Hercules and Air Cushion), Fish Turners, Ferrules (Brass), Handles, Hammers (Magnetic Tack, Steak, Steel Tack and Iron Tack), Hoes (Shuffle), Ice Axes (Iron), Ice Awls (Lignumvitæ, Iron Heads and Maple H'dle), Ice Tongs, Mouse Traps (Pat. Automatic), Mincers (Cast Steel and Hammered), Nail Sets, Nut Cracks, Punches Round), Screw Drivers (Sewing Machine, Lock Spies, Bit Brace and Implement), Spoons (Tea and Table), Trowels (Garden), Tack Claws, Vegetable Slicers, Washers (Tin and Iron). Send for price lists and discounts.

New York Office & Warerooms, 87 Chambers & 69 Reade Sts., with Coulter, Flagler & Co.

THE ÆTNA SPRING AND AXLE CO.,

John St., Bridgeport Conn., Manufacturers of

THE VERY BEST SPRINGS AND AXLES.

Our Standard Springs, weighing about half as much as the Springs of other makers, to do the same work cost but little more per vehicle than a common Spring. Our Jamb-screw, Collinge Collar, Parallel Arm, Malleable Iron Box Axles are the best in the world. Exclusive makers of

LEWIS'S TORSION AND CROSS SPRINGS.

Supercedes the Brewster Cross and End, dispenses with side spars, weigh less, hangbody equally low, ride easier and cost less. Shop newly stocked with new and improved Machinery. Send for Price Lists

W. H. WILSON Presd. and Treas. O. P. LEWIS (formerly of Spring Perch Co.), Sec. and Supt.

TURNED MACHINE SCREWS,

One-sixteenth to five-eighths diameter.
Heads and points to sample.
IRON, STEEL and BRASS.

Lyon & Fellows Mfg. Co.,

Cor. 1st and North 3d Streets, Williamsburgh, N. Y.

R. COOK & SONS,

Manufacturers of

Carriage & Wagon AXLES,

WINSTED, CONN.

ESTABLISHED 1839.

THE BUCKEYE LAWN MOWER

The lightest running, most durable and best Lawn Mower in the market.

Send for descriptive circular and price list to

MAST, FOOS & CO.,

Manufacturers, Springfield, Ohio.

IMPROVED EXTENSION RACKS.

A. A. WEEKS,

82 John Street, - New York.

MANUFACTURER OF

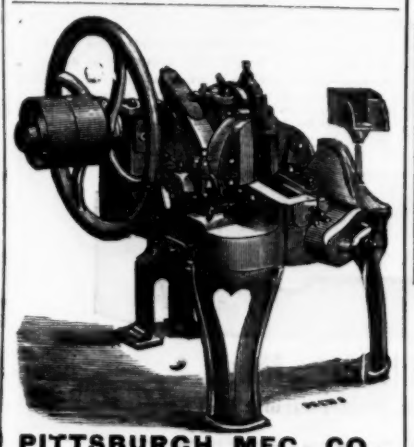
Hat and Clothes Racks, Towel Racks.

TUCKER & DORSEY,

MANUFACTURERS.

We make Till either for Coin or Scrip.

Our Lock has no Rival

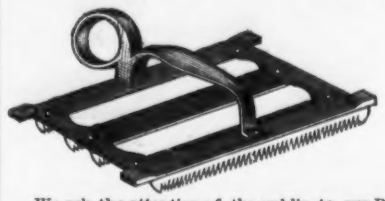


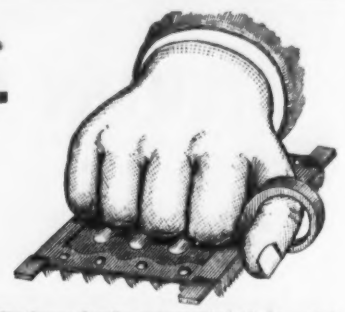
PITTSBURGH MFG. CO.,

Manufacturers of Nail and Spike Machines, Bolts Nuts, Washers, Rivets, &c. Castings, Forgings and Blacksmith Work promptly attended to.

OFFICE & WORKS, Railroad St., near 28th, Pittsburgh, Pa.

HOTCHKISS' Novelty Combs.





We ask the attention of the public to our Patent Novelty Curry Combs, represented above, which are universally acknowledged to be far superior to anything in the market, being neat and durable and the most convenient to handle of any comb yet produced. They are put up in paper boxes of one dozen each, and packed 24 dozen in a case. GIVE THEM A TRIAL. For Sale by the jobbing Hardware, Saddlery and Woodenware trade.

HOTCHKISS' SONS, Bridgeport, Conn.

Philadelphia "STAR" Bolt Works.

NORWAY IRON FANCY HEAD BOLTS,

Carriage & Tire Bolts. Star Axle Clips, &c.

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HOOPES & TOWNSEND,

PHILADELPHIA, PA.,

MANUFACTURE

Machine & Car Bolts,

COLD PUNCHED

Square and Hexagon

Nuts, Washers,

Tank and Coopers' RIVETS,

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WOOD SCREWS,

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"Keystone" Boiler Rivets.

Unequaled in Quality and Finish.

BLACK AND TINNED IRON RIVETS.

HENRY B. NEWHALL 11 WARREN ST. NEW YORK AGENT

W. P. TOWNSEND & CO.,

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Manufacturers of every description of First Quality,

RIVETS.

BUY THE Covert Neck Yoke AND NECK YOKE LEATHERS

Our Yokes are all warranted the **best second-growth hickory** and vary in finish from common to the finest Yokes in use, and our Adjustable Neck Yoke Leather combines neatness, strength and durability. They cost less and are far superior to any other way of leathering yokes. Sample Leather sent by mail on receipt of 60 cents.

For full particulars send for Circular and Price List.

E. & J. C. COVERT, Sole Manufacturers,

OFFICE: Farmer Village, N. Y.

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KINGSTON, MASS.,

MANUFACTURERS OF

Rivets, Hand Iron Cutters, Punches, Shears, and Planing and Shaping Machines; Universal Ratchet Drills, and Patent Tinners' Snips.

New York Warehouse, 116 Chambers Street.

FORT PLAIN SPRING AND AXLE WORKS.

FOR SPRING TRADE.

All dealers in **SPRINGS AND AXLES** will find it to their interest to send to us for Price List and Discounts. WOOD, SMITH & CO., Fort Plain, N. Y.

DOG MUZZLES.

The Patent Automatic, with Spring Jaw.

COMMON WIRE MUZZLES,

New Pattern, in nine different sizes. Also full and varied line of Metal and Leather

DOG COLLARS.

Stair Rods in Brass, Fire Gilt and Nickel-Plated.
Tacks, Escutcheon Pins, Hair Wire, Picture Wire, &c.
Special Brass Goods made to order.

W. T. & J. MERSEREAU, 321 Broadway, N. Y.

H. D. SMITH & CO.,

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Manufacturers of the

BEST QUALITY CARRIAGE MAKERS' HARDWARE.

Manufacture the Largest Variety of Forged Carriage Irons of Best Material and Workmanship.

PRICES LOW FOR QUALITY OF WORK FURNISHED.

SEND FOR PRICE LIST.

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Screw Hook and Strap and T Hinges,

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Send for lithographs and price lists.

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TOPLIFF & EBY,

MANUFACTURERS OF SPECIALTIES IN

CARRIAGE HARDWARE

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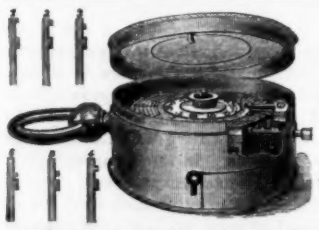

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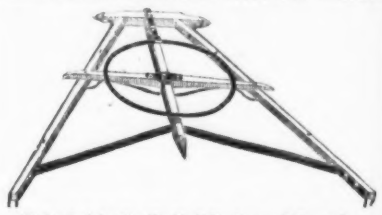

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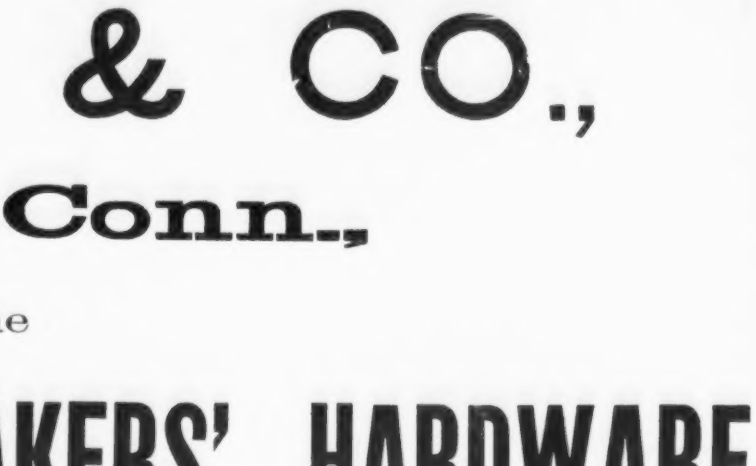
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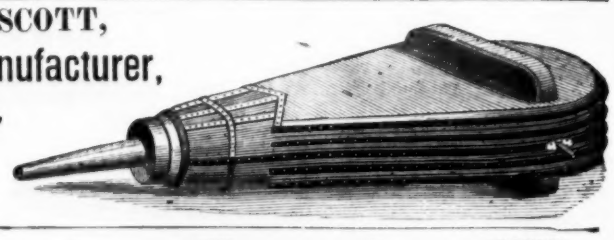

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CONTENTS.

First Page.—An American River Steamer—Performances of the Mary Powell.

Third Page.—An American River Steamer—Performances of the Mary Powell. (Concluded). Ohio Coals.

Fifth Page.—The Kennedy Spiral Punch Patent Self-Feeding Reamer. The Dangers of the Export Trade. The Phonographic Talking Clock.

Seventh Page.—The Ajax Lawn Mower. New Patents.

Ninth Page.—On the Estimation of Phosporus in Iron and Steel.

Eleventh Page.—A Model Iron Freight Steamer.

Fourteenth Page.—Modern Improvements in Europe. Holland and her Colonies. Solid Steel Castings.

Fifteenth Page.—Solid Steel Castings. (Concluded). The American Vertical Steam Engine. Extract from the Dutch Tariff. A New Torpedo Boat. Scientific and Technical Notes.

Sixteenth Page.—Industrial Items.

Seventeenth Page.—Industrial Items. (Concluded).

Eighteenth Page.—The Founding of Alloys.

Nineteenth Page.—Empirical Formula for Strength of Wrought Iron Beams, Channels, &c. Albert Borsig, the German Locomotive Builder. Secretary Evarts on the Export Trade.

Twentieth Page.—A Locomotive for War Purposes.

Twenty-first Page.—Trade Report. General Hardware. Iron. Metals. Coal. Imports. Exports.

Twenty-second Page.—Old Metals, Paper Stock, etc. Philadelphia. Pittsburgh. Chattanooga. Boston. St. Louis. Cincinnati. Baltimore.

Twenty-third Page.—Baltimore. (Concluded). Richmond. Louisville. Foreign. Our English Letter.

Twenty-fourth Page.—How the Yale Locks are Made.

Twenty-seventh Page.—The Iron Age Directory.

Thirtieth Page.—New York Wholesale Prices.

Thirty-first Page.—New York Wholesale Prices (Concluded).

Thirty-fifth Page.—Philadelphia, Buffalo Chicago and Pittsburgh Hardware and Meta Prices.

Thirty-seventh Page—Boston and St. Louis Hardware and Metal Prices.

The letter from a correspondent on the dangers of the export trade, published on another page, deserves careful attention. It deals with a side of the question which, in the general eagerness to secure foreign trade, is quite likely to be overlooked by exporters and manufacturers. In securing a large export trade we must be careful that it is upon a sound basis, otherwise more harm than pro may be expected from an extension of our foreign relations.

Modern Improvements in Europe.

The visitor at Rome and Pompeii in Italy, and at Malaga and Granada in Spain, is struck with the high degree of perfection attained in the hydraulic engineering of those ancient cities. Throughout the Roman Empire, and in the more important cities of Moorish Spain, public improvements such as sewers, aqueducts and water works were extensively introduced; in Seville, Granada and Pompeii nearly all the courtyards, even of the less pretentious private buildings, were graced with fountains, and the latter city was even capable of being flooded on the pavements of its streets through its entire length and breadth for purposes of cleanliness. Later on in the middle ages, and even in modern times, these public improvements nearly everywhere fell into decay; the people degenerated during the continual wars and civil turmoils, and the necessity of maintaining these works for the sake of cleanliness and public health was no more felt. Nor were the cities of this continent much better off than those of the Old World until within the past half century, when in England first, and in this country soon after, a reaction set in against the then existing system of execrable sewerage and the absence of public water supplies. The rapid increase of population in cities like London, New York, Philadelphia and Boston, loudly called for reform in conditions affecting the public health. The importance of good water came to be better appreciated, and public water works are again receiving the attention of the ablest engineers of the world. During the past 10 or 20 years the Europeans have been awakened to the desirableness, or rather necessity, of good water, and have freely incurred the enormous expense involved in such undertakings in cities, many of which were most unfavorably situated. In order to convey an idea as to what has been accomplished in some of the leading centers of population in Continental Europe, we have compiled a table showing the municipal expenditures of the following cities, which will assist us in ascertaining to what extent the expenditure in general has increased during a period of about 10 years:

MUNICIPAL EXPENDITURE.

Paris	1866	$30,000,000	1877	$44,000,000
Berlin	1865	3,629,800	1875	9,200,000
Vienna	1865	5,400,000	1874	13,500,000
Munich	1864	940,000	1874	1,068,200
Stuttgart	1864	515,000	1874	6,005,000
Breslau	1866	924,800	1875	1,697,200
Copenhagen	1865	900,000	1874	1,600,000
Florence	1866	1,751,800	1875	4,742,400
Rome	1871	2,400,000	1875	3,900,000
Genoa	1866	1,544,200	1875	2,332,000
Turin	1865	2,044,200	1874	2,500,000
Total		$50,049,800		$90,544,600

The foregoing shows that the general annual municipal expenditure in eleven of the greater cities of Continental Europe rose during the interval named about 80 per cent. The following table shows the increase of population:

Paris	1866	1,825,000	1877	2,000,000
Berlin	1867	702,437	1876	966,808
Vienna	1865	550,000	1874	670,200
Munich	1864	167,000	1875	193,000
Stuttgart	1864	69,000	1871	91,000
Breslau	1867	166,000	1875	234,000
Copenhagen	1870	180,000	1875	180,000
Florence	1866	191,235	1875	177,000
Rome	1871	250,000	1875	260,000
Genoa	1867	166,000	1875	234,000
Turin	1862	214,715	1872	212,644
Total		4,481,387		5,218,652

The population, it will be noticed, increased only about 16 per cent.

In the following table we show the public improvements, or extraordinary expenditure, in nine of the above cities, as compared with the general municipal expenditures:

		Extraordinary expenditure.	Total expenditure.
Berlin	1875	$2,000,000	$9,200,000
Vienna	1874	7,300,000	13,500,000
Stuttgart	1874	5,267,200	6,005,000
Breslau	1875	24,400	1,697,200
Copenhagen	1874	320,000	1,600,000
Florence	1875	1,354,200	4,742,400
Rome	1875	1,000,000	3,900,000
Genoa	1875	852,800	2,332,000
Turin	1874	628,600	2,500,000
Total		$18,747,200	$45,476,600

From what precedes it will be observed that about 41 per cent. of the expenditure in 1874-75 was of an extraordinary nature. Some of the cities named evidently went beyond their means, inasmuch as they undertook more than either the increase of population or the prosperity of the times warranted. Prominent among these is Florence, whose population since the government has been transferred to Rome has decreased instead of increasing, and Florence is now counted among the bankrupt cities.

Aside from these public expenditures in the shape of improved drainage, gas works, widening of streets, new promenades, parks, filling up of swamp lands and increase of public schools, there have been private undertakings on a vast scale in all these cities, prominent among which are horse-car lines, or "tramways," as they are called in Europe, originally introduced in the United States and a purely American invention. These, with scarcely an exception, have proved remarkably profitable all over Europe, and on many such lines steam is now gradually superseding horses. Elevated railways are not yet in Europe, except in a small portion of London, underground railroads and belt steam lines being thus far preferred. We feel confident, however, that the new system of elevated railways, such as we now have in this city, will spread rapidly to other American cities, and be also preferred in the near future in many cities of Europe topographically somewhat similar to New York.

An intelligent inspection of the modern improvements lately completed or in progress in the principal cities of Europe should, we think, meet the existence of a market there for an extensive and important line of American sanitary goods of various kinds. In the mechanics of hygiene it is probable that this country has made more progress than any other. Our plumbers' supplies, ventilating devices, heating apparatus, &c., are better and cheaper than many similar articles of foreign production with which they are likely to come in competition. It is probable that such goods will require some modification to adapt them to the peculiarities of European architecture, but the field is large and gives promise of profit, and an examination of it will probably well repay those of our manufacturers who, visiting Paris this summer, have time to study the architecture and home lives of the peoples of Europe.

Holland and her Colonies.

Holland is one of the most interesting countries of Europe, and her people command in a peculiar degree the respect of all civilized nations. With scanty means and against many and extraordinary obstacles, they have accomplished great and creditable results. Her history is full of chapters of which any nation might be proud.

First the great struggle against Philip II and his Spaniards, then the best soldiers of Europe, commanded by able generals and backed by all the treasure of Mexico and Peru, beginning in 1579, and with the exception of an armistice of some years, only finally terminated in 1648; next the innumerable wars with England, France, Spain and Portugal, chiefly naval contests; the incorporation of the Netherlands with France under Napoleon, and finally the separation from Belgium. During these struggles and changes Holland by turns won and lost colonies. At one time even Java passed out of her control and was in possession of the British from 1794 to 1814. Cape Colony and Ceylon, now found to be of such great value, she had to abandon to England—the former, with Demerara, in 1814, after forfeiting Ceylon in 1802. While fighting external enemies the German Ocean was constantly making encroachments on her shores, but discouraged by nothing the people of Holland have not only held their own, but have gained an enviable rank among modern nations, and at the present day are comparatively speaking the richest.

Instead of bending under adversity, the Dutch have profited by it. While the sword and flames devastated during the long war of independence the rich Southern provinces, of which Antwerp was the flourishing port, the Northern provinces not only stoutly resisted the Spaniards, but their vessels captured the treasure-laden galleons of Spain, while their privateers laid waste the coasts of Spanish America. In 1602 they founded the Netherland East India trading society and expelled the Portuguese from some of the most valuable colonies in the extreme East, such as the Spice Islands, Ceylon, Java, Sumatra, Celebes and Borneo. Those still in the possession of Holland form her greatest source of income, especially Java. The unparalleled prosperity of this colony is due to a great many circumstances, chief among which is the geographical position of the island on the great highway of Eastern commerce by sea. The island is moreover very fertile, well watered, not too mountainous, with an abundance of native labor, and produces everything grown within the tropics of an unsurpassed quality.

Although Dutch colonial management is not as much to be admired as that of England, for it is more narrow-minded and egotistical than the latter, it is undoubtedly the best next to that of England and France. At all events it has produced great results equally beneficial to the colonies and the mother country, and is gradually becoming as liberal as that of either England or France. At times the pressure on the natives has been a little too strong, leading to short wars like the late Achenese war in Sumatra, but considering the piratical leanings of these natives it is rather a matter of surprise than otherwise that Holland has been able to get along with them as well as she has, and that troubles are not more frequent.

The following are the present possessions under the Dutch crown:

	Square miles.	Populat'n 1872.
Holland proper	12,680	3,688,337
Colonies in Asia:		
Java, Madeira, &c.	51,336	15,573,000
Sumatra, Banca, Billiton and Palembang	116,175	2,254,000
Borneo, Western, Southern and Eastern Coast*	199,298	1,177,000
Celebes	45,710	341,000
Amboina, Ternate, Banda	42,943	366,000
Timor and small Sunda Islands	92,037	2,526,876
Colonies in America:		
Dutch Guiana	62,747	50,778
Dutch West Indies: Curacoa, Saba, St. Eustatius, St. Martins, Bonaire and Aruba	368	35,027
Colonies in Africa & Australia:		
Guinea Coast, Africa	10,630	120,000
New Guinea, Australia	68,000	200,000
Total	701,924	26,332,018

Since 1872 the population of Holland has increased to 3,809,327. In other words, a European population of about 4,000,000 holds in subjection, at a distance of thousands of miles, colonies numbering a population of, together, some 23,000,000, and has been doing a thriving business with them for centuries past. It has to be admitted that a nation able to maintain colonial sway so successfully over mostly barbarous nations in tropical countries, covering an area of 689,244 square miles, where warfare as we understand it is nearly impossible, must possess powers of government of the very highest order.

* The independent State of Sarawak, governed by the Englishman Brooke, contains 200,000 inhabitants.

On the 1st of January, 1877, there were in Holland 2688 primary schools and 1174 higher educational institutions. In 1826, when Belgium was still united with Holland, the Netherlands imported $14,400,000 worth of merchandise and exported $9,200,000; total trade, $23,600,000. After the separation from Belgium, Holland alone imported, in 1834, $17,200,000 and exported $12,400,000; together, $29,400,000. In 1872 the import was $179,830,000 and the export $153,570,000; together, $333,400,000. In 1875 the import had risen to $292,600,000 and the export to $227,920,000, constituting a total trade of $520,520,000. The high state of material advancement reached by Holland is best shown by the following statistics: The Dutch merchant navy is now composed of 1258 sailing vessels of a joint capacity of 366,284 tons, and of 110 steamers measuring 112,879 tons. There are in operation in Holland and the Grand Duchy of Luxembourg 1262 miles of railroad, which cost $113,254,192, or $89,741 per mile, and in the Island of Java 296 miles, costing $17,266,916, or $58,196 per mile. The number of post offices in Holland is 1243, which in 1875 distributed 55,000,000 letters and postal cards, and 36,000,000 newspapers, circulars and samples. Of telegraph offices there were, in 1875, 330; instruments, 379; operators, 1082; the telegraphic area was 19,725 miles; of lines there were 2064 miles, and of wires 7399; the number of messages sent was 2,198,000, or 578 messages for every 1000 inhabitants. In 1876 the number of instruments had increased to 397, and that of operators employed to 1121, while of messages there were 641 to the 1000 inhabitants. The proportion of letters forwarded in 1875 in comparison with telegrams dispatched was 25 letters to every telegram. On the 1st of November, 1876, the new canal connecting Amsterdam with the German Ocean was opened. This is a gigantic public improvement, resolved upon in 1865, a full description of which has appeared in these columns.

The great qualities of the Dutch are tenacity of purpose and untiring patience; they are, perhaps, less enterprising and active than most of their old commercial rivals, but once determined, after deliberate reflection, nothing discourages them. Throughout their political, colonial and commercial history we discover these great characteristics at every step, and they have been the secret of their astonishing deeds and extraordinary success. That with a nation so constituted and in possession of such rich colonies we should do a large and rapidly increasing business, is to be expected, considering our intimate relations with the Dutch during the past two centuries and a half. The following table shows our traffic with Holland and her colonies since the war:

	Holland.		Dutch West Indies		Dutch East Indies.		Totals.
	Import	Dom. Export	Import	Dom. Export	Import	Dom. Export	
1864	1.33	3.43	1.00	1.05	0.69	0.12	7.62
1865	0.78	3.01	0.59	1.54	1.08	0.13	7.13
1866	2.78	2.41	0.73	1.13	0.78	0.16	7.99
1867	1.99	2.97	0.70	0.85	2.64	0.20	8.95
1868	1.27	4.62	0.81	0.93	1.90	0.14	9.67
1869	2.69	3.94	1.00	0.93	1.93	0.13	10.64
1870	1.35	6.12	0.73	0.94	2.55	0.16	11.85
1871	2.05	12.40	1.06	0.84	3.04	0.20	19.59
1872	2.55	11.01	1.07	0.79	7.33	0.11	22.86
1873	2.94	10.84	1.19	0.95	7.56	0.26	23.74
1874	2.52	13.71	1.65	0.99	3.86	0.45	23.18
1875	2.35	7.48	1.52	0.85	6.78	1.03	20.01
1876	2.44	12.19	0.70	0.87	5.99	0.63	22.82
1877	2.55	10.41	0.74	0.97	4.51	2.67	21.85
	29.19	104.54	13.49	13.63	50.66	6.39	217.90

Recapitulation.

Import	$93,340,000
Export	124,560,000
Total	$217,900,000

EXPORT OF DOMESTIC GOODS TO HOLLAND.

	—Fiscal Years.— 1876	1877.
Agricultural implements	$54,196	$20,417
Cattle and horses	.....	35,560
Potashes	4,295	4,109
Bark	10,431	3,425
Breadstuffs	2,973,845	874,457
Carriages	8,190	15,136
Iron	70,498	3,618
Copper	.....	78,175
Cotton	4,284,110	3,209,579
Cotton fabrics	21,097	2,721
Drugs	13,906	11,612
Dyes	48,039	29,995
Fancy goods	1,007	4,170
Dried apples	3,620	248,694
Horsehair	7,935	.....
Manufactures of hemp	18,004	2,388
Hides	.....	9,940
Leather and leather ware	131,235	80,525
Hops	.....	30,499
Stoves	3,224	197
Machinery	51,608	40,548
Hardware	26,931	19,700
Manures	3,296	8,040
Marble	.....	3,974
Naval stores	177,637	199,231
Petroleum	1,589,142	1,752,652
Lubricating oil	37,722	120,517
Essential oils	4,118	4,316
Provisions and tallow	937,705	1,415,458
Seeds	11,749	.....
Soap	1,430	.....
Sperm	1,700	1,110
Spirits of turpentine	149,530	73,460
Starch	34,236	54,295
Leaf tobacco	1,198,502	1,595,517
Manufactured tobacco	34,332	46,337
Timber, lumber and staves	122,486	127,670
Furniture	5,561	13,111
Wooden ware	9,365	18,983
Stationery	.....	4,140
Plated ware	.....	2,017
Sewing machines	.....	1,131
Fire engines	.....	1,840
Clothing	.....	1,775
Other goods	134,653	231,718
Total	$12,185,355	$10,411,757

EXPORT OF DOMESTIC GOODS TO THE DUTCH COLONIES.

	—Fiscal Years.— 1876.	1877.
Breadstuffs	$284,816	$355,116
Blacking	.....	1,011
Candles	4,485	2,673
Carriages	5,947	3,809
Brooms	1,100	1,190
Cordage	5,864	7,538
Cotton fabrics	14,499	35,456
Drugs	7,906	8,612
Preserved fruit	1,835	1,775
Glassware	1,236	5,795
Hay	1,545	3,061
Ice	9,105	17,270
Machinery	2,355	1,029
Hardware and guns	8,384	6,283
Oakum	.....	1,232
Leather and leather ware	11,367	11,769
Matches	3,431	3,723
Perfumery	.....	1,760
Tar and pitch	732	1,586
Petroleum	644,086	2,638,700
Lamps	.....	3,097
Provisions, fish and tallow	308,213	329,446
Vegetables	4,745	6,802
Soap	3,617	3,754
Refined sugar	5,068	9,143
Tobacco	62,405	46,648
Lumber, timber and wooden ware	46,280	36,674
Scales	.....	2,617
Trunks	.....	1,410
Other goods	68,797	85,237
Total	$1,507,118	$3,634,215

The shipments of petroleum to Java alone have, from $619,891 in 1876, risen to $2,600,646 in 1877, nor has there been any abatement in these shipments since. Large fortunes have been realized in this particular trade.

The exports from Holland proper consist of fish, butter, cheese, refined sugar and gin; from the Dutch East Indies of indigo, coffee, sugar, cinnamon, sago, pepper, cloves, nutmegs, mace, rice, tobacco, wax, hides and tin. From Curacoa we receive dye woods, hats, salt, goats' skins, and some goods produced on the Spanish Main.

Of iron and steel in various shapes England exports to Holland large amounts, as the following statistics will show in detail:

BRITISH EXPORTS OF IRON AND STEEL TO HOLLAND.

	1876.	1877.
Hardware and cutlery	$505,935	$441,320
Pig iron	3,655,680	2,940,263
Bar, &c., iron	262,965	196,500
Hoops and armor plates	721,105	577,085
Cast and wrought iron	1,130,335	640,135
Machinery	1,287,385	941,655
Total	$7,563,405	$5,736,960

The item of machinery is quite important, but it is impossible to determine whether that sent from England has been all for Holland or whether in part it has gone in transit to Germany. Rotterdam, in particular, is, through its various steamship lines, receiving a great many goods from England and elsewhere intended for Rhenish and Northwestern Prussia. We are very much inclined to believe that the bulk of these iron and steel imports do not remain in Holland.

The Dutch are not a manufacturing nation, but in the products of the dairy, in sugar refining and in distilling they have attained great skill. Their madder industry, once of great importance, has been killed by artificial dyes of recent invention. Strictly speaking, the Dutch are a trading nation, and as we manufacture so many goods now rapidly gaining a foothold in Europe, we ought to be able to sell them considerable, especially hardware and agricultural implements. The Dutch duties are very moderate, and as the Dutch are fond of good quality in everything and are able to pay for it, the superiority of our goods should secure for them a profitable market in Holland and her colonies.

Solid Steel Castings.

A great barrier to the introduction of steel for constructive purposes has been found in the difficulty met with in counteracting a tendency toward defective homogeneousness in the so-called "low" steels. On account of their great strength and ductility, these steels would be eminently fitted for many engineering uses if it were possible to devise other means of correcting their defects than by forging and hammering, while an inestimable advantage as regards facility of giving it at once its working shape would be gained if steel without blow-holes and malleable could be poured into molds. "Mild" or "low" steel containing a small amount of carbon only, is not as liable as the hard steels to the destructive action of internal strains, but its homogeneousness is commonly defective on account of the presence of blow-holes. A steel will generally flow better while casting the more it is carbonized, and it is probable that the greater fluidity of hard steels permits a freer escape of the gases, which there are good reasons to believe cause blow-holes. In the decarburization of pig iron by the modern processes of making steel, the carbonic oxide formed by the reaction of carbon upon oxide of iron remains in solution in the metal, escaping partially only during the cooling period, when the solubility rapidly diminishes. The presence of the imprisoned bubbles of carbonic oxide affects the mechanical properties of the metal, and calls for some means of removing or preventing it. Rolling, forging or hammering, though rendering the metal more compact, are expensive processes. Great pressure upon the metal in a molten state was successfully introduced by Whitworth, who uses the hydraulic press, while others have recommended steam. Nessel and other metallurgists, starting from another point, sought to gain their object by aiding the expansive force of the gases by causing the formation of a vacuum above the fluid metal. These methods, by which the object in view is attained by mechanical means, though experimentally successful in the production of a solid ingot, did not open to the metal that wide range of application which lines of experiments based upon chemical inquiry showed to be possible. While the former sought a remedy, the latter, attacking the root of the evil, succeeded in detecting a preventive. Hard steel castings without blow-holes have for some time been produced, chiefly by Krupp and by some Sheffield firms, but it is only recently that soft steel fit for industrial and structural purposes has been cast without the defects which the material is so liable to suffer from. By a long series of experiments, ably con-

ducted and persistently renewed, the history of which is given by Mr. A. L. Holley in the May number of the *Metallurgical Review*, the engineers of the Terrenoire Company have gradually developed the manufacture of a malleable metal which, after annealing, has the physical qualities of forged steel. Its average tensile strength in a cast annealed state is as follows: Hard steel, 47.51 tons per square inch and 8.1 per cent. elongation; medium steel, 46.92 tons per square inch and 14.6 per cent. elongation; soft steel, 31.72 tons per square inch and 25.3 per cent. elongation.

The process consists of the formation of an initial bath of manganiferous pig, to prevent oxidation during the process. Then such softening or decarburizing materials as wrought iron are dissolved in the bath, and toward the end of the operation, which is determined by a series of slag and metal tests, silicon and manganese are added in the shape of a special pig, in such order and proportion as to prevent the formation of blow-holes while casting, and at the same time to give to the steel certain special physical qualities. The material used for the initial bath varies according to the grade of steel to be produced; thus a hard steel requires 11 to 14 per cent. of manganiferous pig, holding from 6 to 8 per cent. of manganese, while soft steel is made from an initial bath containing as much as 14 per cent. of manganese. Oxidation during the whole process must be kept as low as possible, and all means must be employed to prevent cooling the bath. The decarburizing or refining materials must therefore be preheated. They are chosen with reference to the quality of the product arrived at, and may be Bessemer or open-hearth scrap, fountains from previous castings, puddled bars or direct blooms, the proportion varying from about 78 per cent. for hard steel to about 72 per cent. for soft metal. The final addition, too, is different, according to the product; for hard steel it usually consists of 11 per cent. of special pig containing 3.5 manganese, 3.0 carbon, 4.2 to 4.1 silicon and 0.1 phosphorus; for soft steel from 3½ to 4 per cent. of the entire charge of a pig holding 1.6 carbon, 14 per cent. manganese, 75 per cent. silicon, and 0.12 phosphorus. The chemical reactions to which the favorable action of the special pig upon the quality of the metal is due, are as follows: The silicon prevents blow-holes by decomposing the carbonic oxide; the manganese reduces the oxide of iron and prevents a further production of gases by the reaction of this oxide on the carbon; the silica formed produces silicate of iron, which is rendered more fusible by the formation of a double silicate of iron and manganese. The steel contains notable amounts of manganese and silicon, which, as they undoubtedly impart special qualities to the metal, must be closely maintained. The following are the averages of 6 and 12 charges:

1.	0.943 Mn.	0.560 C.	0.340 Si.
2.	0.880 Mn.	0.500 C.	0.390 Si.

It is therefore indispensable, in order to know the chemical composition of the bath, to keep oxidation under control during the whole operation. Only by this means can the exact amount of the special pig to be added be ascertained. The metal produced by the Terrenoire process may be cast into any desired shape and requires only slow annealing. It is, therefore, eminently fitted for armor plates, guns, projectiles, heavy parts of machinery, rolling-mill machinery, &c. The novelty of the process consists in the employment of definite proportions of manganese and silicon at regulated times during the operation. Its extraordinary qualities and the low price at which it will be possible to produce it insure for the steel made by the Terrenoire process a rapidly increasing sphere of usefulness.

The American Vertical Beam Engine.

Upon the first page of this issue will be found an illustrated article upon the performances of the American vertical beam river engine. It is from the pen of the late Theron Skeel, M. E., a clever young engineer of this city who gave promise of a bright future. The article was placed in our hands but a few weeks before his death, and is peculiarly interesting and valuable for several reasons. Heretofore we have had no data in regard to the performances of the well-known American vertical beam engine as applied in vessels. These engines, with their long stroke and high piston speed (in the case of the Mary Powell it sometimes reaches 600 feet per minute), run several years with very moderate expense. Their durability is wonderful, all the moving parts being hung, as it were, from the main center, and in balance they adjust themselves to all sorts of conditions. It is a sort of tradition that a beam engine in a steamer never wears out. The vessel may be broken up and the engine sold for old iron, but it never seems to reach a point where it cannot go on with its regular work. It has long been known that these engines were very economical. Prof. R. H. Thurston, in his report upon the Vienna Exposition, says of this form of engine that "it is only excelled in economy by the best compound engines." The fact of its economy, while well established, was only known through the general results of coal and repair bills.

The figures obtained by Mr. Skeel have a much higher value than those commonly reached by taking account of fuel, power, &c., for a single trip. The trials practically extend over three years, and the results are those which can be obtained commercially through a series of years. We are doubtful whether the best compound engines could show any better results if they were tested by the performances of a year or two instead of for a single racing trip when fresh from the builders.

Evidently the beam engine, for a light paddle boat, cannot be radically improved. The large wheels, driven at a high rate of speed; the long stroke, with long connecting rods; the perfect balance of the reciprocating parts—all contribute to this result, while the small internal friction of the engine due to this design adds to it considerably.

Mr. Edward Riley's paper on the "Estimation of Phosphorus in Iron and Steel," of which we print a synopsis in another column, will be found of much interest. The importance of accurate methods for the qualitative analysis of iron and steel can hardly be overestimated, and everything tending toward greater accuracy should have the most careful attention. Mr. Riley's experiments show conclusively that the ordinary methods of analysis give phosphorus determinations which are much too low. His own method, however, shows much closer results, and as his experiments were made in many cases with samples containing known quantities of phosphorus and the analyses were made by experienced chemists, the results attained seem worthy of confidence.

Extract from the Dutch Tariff.

* Iron: Pig, old, scrap, bar, rod, wire, rails and pipe, free; all other wrought iron and hardware, 5 per cent.; manufactures of steel, 5 per cent.; copper, free; finished copper ware and gilt wire, 5 per cent.; lead, free; plumbago, 5 per cent.; lead pencils, 5 per cent.; spelter and zinc, free; zinc ware, whether lacquered or not, 5 per cent.; tin plates and tin ware, 5 per cent.; platina, ditto ware and wire, per lb., 4c.; plated ware, 5 per cent.; aluminium, 5 per cent.: ammunition, such as guns, pistols, sabres, swords, bayonets, bullets, cartridges, and percussion caps, 5 per cent.; cannon of gun metal, 100 lbs., $3; ditto, iron, 100 lbs., 50c.; ditto balls, 100 lbs., 30c.; bronze ware, 5 per cent.; chirurgical instruments, musical and all scientific ditto, 5 per cent.; gold and silver wire and ware, 3 to 5 per cent.; ditto fringes, &c., 5 per cent.; polishing powder, 5 per cent.; grindstones, 5 per cent.; gold and silver watches and movements, 5 per cent.; gold and silver leaf, 3 per cent.; clocks and movements and clock cases, 5 per cent.; glass and glass ware, 5 per cent.; earthenware, 5 per cent.; camphene, petroleum and lubricating oil, 100 lbs., 22c.; lamps and shades and lanterns, 5 per cent.; needles, 5 per cent.; steel pens, 5 per cent.; sieves, 5 per cent.; india rubber and gutta percha goods, 5 per cent.; brush ware, 5 per cent.; printing ink, 5 per cent.; tallow candles, 100 lbs., $1.20; wax, sperm and composition ditto, 5 per cent,; linseed cake, free; toys, 5 per cent.; matches, 5 per cent.; furniture, 5 per cent.; tools made of wood, iron and steel, free; hides, skins and leather, free; prepared ditto and leather manufactures, 5 per cent.; saddlery, 5 per cent.; cordage, free; prepared furs, 5 per cent.; paper of all sorts and paper hangings, 5 per cent.; ink, 5 per cent.; blacking, 5 per cent.; carriage material, 5 per cent.; varnish prepared with oil, 5 per cent.; ditto, with 50 per cent. alcohol, 100 lbs., $1.40; stone, free; vessels and boats, 1 per cent.; wood, free; cooperage and wooden ware, 5 per cent.

A New Torpedo Boat.

The attention of the British Admiralty has recently been called to what is termed a "Fish Torpedo Boat," of curious design, for the purpose of working under water, and intercepting the Whitehead and other torpedoes. A complete model, more than eight feet in length, being one-twentieth of the full-sized boat, has been made and satisfactorily tested. It may be stated that the original design was made by the late Lord Milton, who was a skilled mechanic, and worked at his trade, assisted by Mr. Turner, of Wentworth. The design was left in an uncomplete state for some time, but lately it has been taken up by Mr. Turner and Mr. White, of Thorpe, near Rotherham, who have made several additions and improvements. The boat in every way represents a monster fish, and is worked by compressed air. In the fore part there are two large eye holes, which, when the boat is under water, sends out a powerful electric light that will show the keel of a vessel, or a torpedo, a long way off. The tail plays an important part in the machine, being not only the propeller, but being perforated on either side expels the water and foul air. In the front there is a ram of sufficient power to penetrate an ordinary war vessel. Where the nostril of the fish should be there is a revolving gun, worked by hydraulic power, and fired by electricity with a new explosive. The model is without masts, the deck being not only clear of obstructions, but air tight. The interior of the boat is divided into compartments, and can be sunk to any required depth by taking in a certain quantity of water, which is admitted by an arrangement at the bottom. This can be expelled, and the boat then rises. Each compartment is supplied with compressed air, and sufficient can be procured to supply the wants of three or four men—sufficient for working the boat—for from three to ten hours at a time. When submerged the boat can be propelled at the rate of 18 knots per hour. The gun is a very peculiar one, and was the invention of the late Lord Milton. It is rotary, having four chambers placed like the spokes of a wheel, so that while one shot is being fired a second chamber could be charged, a third sponged, and a fourth cleaned, so that the discharges follow each other in rapid succession.

* The guilder has been calculated at 40c.

Scientific and Technical Notes.

A startling discovery, says *Engineering*, has recently been made by Hughes that certain unhomogeneous conducting substances placed in circuit with a battery possess the property of

CONVERTING SONOROUS VIBRATIONS INTO UNDULATORY CURRENTS OF ELECRICITY,

by which not only can notes and articulate speech be transmitted to a distant telephone placed in the circuit, but sounds so minute as to be otherwise inaudible can be magnified into loud noises. One of Prof. Hughes' most interesting experiments is the following: A glass tube is filled with a mixture of metallic tin and zinc, commonly known as "white silver powder." This powder is slightly compressed by two plugs of gas carbon inserted at the ends, to which are attached wires having a battery and a galvanometer in circuit. The plugs are cemented in their place by being covered over with ordinary sealing wax. Upon grasping this tube by the two ends and giving it a tensile strain by pulling the two ends in contrary directions, but in a line with its length, the galvanometer needle is deflected in one direction, and on pushing the ends toward one another the needle of the galvanometer is instantly deflected in the opposite direction. In this case the finely divided metallic particles forming the contents of the tube are brought into more intimate connection by compression, and are more separated during the operation of extension, and thus the resistance of the circuit is varied, increasing the current in the first instance and decreasing it in the second. This experiment alone would be a remarkable example of the marvelous sensitiveness as a detecter of minute variations of electrical force, for it is hardly posssible to conceive the minute increment that takes place in the length or capacity of a glass tube some 3 inches long when extended by pulling with the fingers. But this tube is far more sensitive still. If the tube is attached to a box opened at one end, serving as the mouth-piece of the instrument, and the wires are connected to a distant bell telephone having a battery of three Daniell cells in circuit, the sounds are so loud that it is possible to sing into one instrument and hear at the same time singing from a distant station in another. The most sensitive of a series of apparatus invented by Prof. Hughes is, however, the following: It consists of a small pencil of gas carbon pointed at each end and lightly supported in a vertical position between two little cups scooped out of the surface of small carbon blocks which are attached to a thin vertical sounding board secured to a more solid base. The carbon blocks are connected by wires to the battery and line wire leading to a distant telephone. This marvelously simple apparatus not only takes up and transmits articulate speech with great power and distinctness, but it detects and converts into loud noises the minutest possible vibrations. Even the very footfalls of a little common house-fly, as it walks along the board, are heard with unmistakable distinctness by a person whose ear is at the telephone, which may be miles away.

A patent has been granted to Dr. C. Loewig, of Breslau, Germany, for an improved process for the manufacture of

CAUSTIC ALKALIES AND ALUMINA.

For the production of hydrate of alumina, manufacturing chemists have hitherto prepared aluminate of soda either by the use of cryolite and lime or the employment of bauxite and carbonate of soda. By introducing carbonic acid gas they precipitated hydrate of alumina from the solution of such aluminate of soda, at the same time obtaining or regaining the soda as carbonate of soda. Dr. Loewig now alters this process in such a manner that instead of obtaining carbonates of alkalies he obtains caustic alkalies. He heats carbonate of soda or potassa to red heat with so much alumina or alumina ore as to present one equivalent of alkali to one equivalent of alumina. In this manner by solution and subsequent lixiviation aluminate of soda is obtained which is entirely free from carbonate of alkali. This product is decomposed by the addition of a pulpy paste of hydrate of lime, of hydrate of strontia, or of hydrate of magnesia, whereby the aluminates of said earths will be formed as precipitates, the caustic alkali remaining in solution. Three equivalents of the earths to one equivalent of alumina are required for precipitating the entire alumina from the alkaline aluminates. The solution of the caustic alkali is evaporated (by preference in a vacuum pan, in order to avoid the absorption of carbonic acid from the atmosphere), and finally heated in an iron caldron, in order to produce the dry hydrate. In the employment of the aluminates of the earths, the production of a new and important preparation—the gelatinous hydrate of alumina—may be obtained in an economical manner. By way of preparing this alumina from the aluminates of the earths, they are permitted, after having been agitated in much water, to flow slowly into muriatic acid, and after neutralizing the latter so much aluminate is added that the entire alumina of the aluminates applied will be separated, which is easily achieved. It is merely necessary to observe that the same must not take place at a high temperature, because alumina precipitated in a warm state possesses less discoloring or active qualities than when precipitated in a cold state. Hence it is necessary to cool down the solution of the aluminate, warmed by the reactions, before proceeding to separate the alumina. After this process the alumina is washed with water in a suitable apparatus—for instance, in a filter press—until it is free of the chloride compounds, and finally subjected to considerable pressure.

Mr. Elbridge Wheeler in a note on

IRON AND STEEL IN COMBINATION

says: When we consider the two great interests of to-day—in iron upon the one hand and steel upon the other—both contending for the mastery in supplying the great industrial wants of all civilized nations, and believing, as we do, unless united or combined together, in distinct lines and proper proportions, the full benefits of either, or both can never be obtained, we feel it to be our duty to do all we can to accomplish such a result. As well might we contend that any one of the many different woods will answer the purpose of all the known woods, as that steel can take the place of iron, or iron the place of steel—"it is not in the wood." It is well known that iron when crystalline will fracture like steel, and when not crystalline will show fiber; and that no steel, however low in grade, can be fractured upon one side without a separation of the bar, while one of fibrous iron can be fractured on one side and the opposite side remain unbroken; hence we contend that notwithstanding steel has greater tensile strength than wrought iron, it is more liable to sudden fracture, and every smith is aware that he cannot forge steel as he can iron, but that it requires the greatest care, and can be welded only with fluxes, while iron furnishes its own flux. No engineer has yet ventured to place a steel bar in position where severe vibratory strain would be put upon it, of less weight than of iron, to perform the same office. Now, if steel has double the resisting power of iron, why not reduce the weight per foot to one-half that of iron, and then certain grades of steel would be to the consumer twice as cheap as iron. No one doubts the superior wearing qualities of steel over iron under friction, or that it takes less motive power under pure friction to propel steel than iron. As steel has greater wearing quality, less friction, greater tensional and torsional strength, why not displace iron? Simply from the fact that iron has qualities that steel does not and cannot possess, namely, fiber and tenacity, which are the necessary qualities to make steel all that could be desired. Again, we say that to obtain the durability, the tensional and torsional strength of steel and the safe and reliable qualities of iron in one and the same bar, we must unite the one with the other, and we have the properties and qualities of the two metals combined.

A process, depending like that of Professor Barff on the formation of an unalterable magnetic oxide, for the

PROTECTION OF IRON AGAINST OXIDATION,

has been patented in England by Mr. George Bower, of St. Neot's. The means by which he accomplshes the desired end is, however, in every way different from that used by Prof. Barff. It is well known to every tyro in chemistry that if we pass steam over red-hot iron the steam is decomposed, hydrogen being set free, while the oxygen goes to the iron to form the stable magnetic oxide (Fe_3O_4). On this reaction depends the process of Professor Barff, who places the articles in a heated chamber, and then passes in superheated steam, for a time dependent, of course, on the thickness of the film required. Mr. Bower has, however, discovered a process that will most efficiently coat the iron, and at the same time simplifies the whole of the working details. The agent he employs is the oxygen of the atmosphere. The articles are placed in a chamber constructed of fire-brick or iron, and fitted with inlet and outlet pipes; air is passed in, and the chamber closed as completely as possible. The temperature is then raised to the requisite degree, which varies with the nature of the articles, and which ranges from a dull to a bright red heat. At the end of every hour the inlet and outlet pipes are opened, and the air renewed, the pipes being again closed. This process continues until the required thickness of oxide is formed, which will, of course, depend on the purpose for which the articles are designed. The cost of thus protecting iron depends simply on the amount of fuel used, with the labor and wear and tear of apparatus involved; so that the process has, it is claimed, the advantage of being the cheapest as well as the most effective yet brought before the public. The coating has been severely tested, both as to hardness, homogeneity, and capability of withstanding all the ordinary oxidizing influences likely to be brought to bear on it, and has not been found wanting. It is found that the process, as at present carried out, answers best with cast iron; but, with a cheap and easily applied modification, the details of which are not yet made public, it is found to answer equally well for all other descriptions of the metal.

M. Arson, of the Société des Ingénieurs Civils, lately read a paper before that institution on a

FURNACE FOR REHEATING TIRES

for wagons, &c. The bending and welding of these iron rings has given origin to many interesting apparatus and processes. Those employed by the Compagnie des Omnibus of Paris, by the Compagnie des Petites Voitures, and by the workshops of M. Colas, are well known to French Engineers, but do not seem to realize all possible advantages. The heating is unequal, requires much fuel, is slow, and needs much hand labor. The solution of the problem has received attention from the Parisian Gas Company, with satisfactory results, which we condense in as few words as possible. The appliances consist in a reheating furnace and a receiver, along with two light and very easily worked cranes. The furnace is lenticular in shape, and of the reverberatory type. The base is cylindrical, with central fire-place. The hearth is closed by a moveable cover, suspended by chains passing over pulleys, and balanced by counter weights. While operations are proceeding, the products of combustion are thrown back by the roof, and find no other means of exit, except through openings in the hearth, so that they are forced to envelop the hoops to be heated, after which they escape underground, being drawn back by the action of a neighboring stack. The receiver is a cast-iron basin, in which the wheels are placed, solidly attached. The water necessary for cooling the hoops, after they are let on, reaches this receiver by three various openings so as to facilitate the rapid cooling of the tire. In the center is placed a valve for emptying the receiver. As soon as the furnace has reached a working temperature—two hours after lighting—it only takes seven minutes to obtain the necessary heat for tires measuring 5.75 feet in diameter, 3 inches wide and 1 inch in thickness. Heavy tires of the same diameter, but 4 inches wide, and 2 inches thick, require 15 to 18 minutes to reach a temperature of from 1112° F. to 1292° F. In order to save time and labor, several tires of different diameters are heated simultaneously. The crane can be allowed to penetrate between the movable hood and the body of the furnace, so as to pick out any desired tire without interfering with the others. Just after one of the cranes has lifted out a tire the other crane immediately lets in another to take its place, and the hood is let down as rapidly as possible. The working of this furnace as well as the operations of loading, unloading, shrinking and adapting the wheels in the receiver, need the employment of 10 hands and a foreman. The fuel used consists principally in lumber and shavings obtained from waste material and repairs. M. Arson states that such a furnace as he has described is only applicable in cases where a large amount of work has to be done—at least 100 wheels per day; but in such cases the results obtained are highly economical and satisfactory.

In the *Sitzungsberichte der Böhmischen Gesselschaft der Wissenschaften*, M. F. Stolba describes a process for

NICKEL-PLATING IRON AND STEEL BY IMMERSION.

The operation is very simple. To a dilute solution (5 to 10 per cent.) of chloride of zinc, as pure as possible, a sufficient amount of sulphate of nickel is added to color the solution green, which is then boiled in a porcelain dish. Without paying any notice to the precipitation of a basic salt of zinc the objects to be coated are introduced into the bath (after having been perfectly freed from all traces of grease or rust), care being taken to keep each object isolated. The whole is kept boiling from 30 to 60 minutes, water being added to replace the loss by evaporation. The nickel precipitates on all the clean surfaces of metal, in the shape of a white brillant coat, which a longer period of boiling does not render any thicker. The objects taken out of the bath are washed with water holding a little chalk in suspension, after which they may be polished if desired. The chloride of zinc must contain no metal which is precipitated by iron. It is best specially prepared for the purpose desired. A point to which particular attention must be given is that the sulphate of nickel is free from copper. By replacing the sulphate of nickel by sulphate of cobalt a coating may be obtained whose aspect differs but little from that of burnished steel, which adheres firmly to the metal.

A new and simple method of

TESTING GREASE AND OIL FOR ACIDS

is recommended by Dr. Wiederhold to those who use either grease or oil as lubricators for machinery. Either cuprous oxide or coppersmith's scale is put into a small test tube, which is filled with the oil to be examined. If the latter contains no fatty or resinous acids there is no change in its color, but if there is any the oil is colored, becoming light green in its lower portion within a short time, if the amount is small, the intensity of the color varying with the amount of the acid. Oil containing resinous acids is turned blue. These reactions appear within 10 to 20 minutes at an ordinary temperature. They are accelerated, however, by the application of heat. This method is far superior to most of those proposed, as it is very readily and easily employed. Dr. Wiederhold states that the action is so striking that it cannot be mistaken by any one, even though the experiment were made for the first time. The coloring of the oil is probably due to the fact that the fatty and resinous acids decompose the cuprous oxide, metallic copper and cupric oxide being formed. The latter enters into combination with the acids and produces salts which, dissolving in the oil, give it a green or greenish blue color.

For the purpose of

COATING METALS WITH TIN,

Messrs. Neuburg & Co., of Vienna, propose to use a zinc and carbon battery. The inner cell containing the carbon is half filled with chromic acid, and the outer cell containing the zinc is filled with dilute sulphuric acid. The articles to be coated with tin are put into a bath composed of protochloride of tin and cream of tartar, with or without chloride of tin. The proportions of these ingredients are: Eight parts of protochloride of tin, 16 parts of cream of tartar, and two parts of the chloride, if the latter is used. When it is present the tin coating is effected more rapidly, whereas when the bath is composed of protochloride of tin and cream of tartar only the tin coating is very white, but is not produced so rapidly as when the chloride is used. These ingredients should be dissolved in about 100 gallons of distilled water. The black plates are first "pickled" in any suitable manner, and then immersed in the above-described bath or solution, and are allowed to remain in the same for a longer or shorter time, according to the thickness of the deposit or coating of tin required on the plates. While in this bath the plates or other pieces to be coated are connected by a wire with the positive end of the battery, while the negative end of the battery is connected with a piece of tin hung in the same bath. When the plates or other pieces or articles have been sufficiently coated with tin they are held over a fire in order to give the tin a lustrous appearance.

A monster locomotive is building at the Springfield shops of the Boston and Albany road. Its weight will be about 40 tons. The boiler is 10 inches longer than the standard, with 173 flues—11 above the ordinary number and 4½ inches longer—12 feet 3 inches long and 2 inches in diameter. Of the inside fire-box the side sheets are 60 by 60 inches, and the flue and door and crown sheets 60 by 42 inches. The total area of heating surface is thus 455 17-24 square feet, not considering the forward flue sheet. The cylinders, with 8 by 1½-inch ports, are 18¾ by 28 inches, the largest heretofore being 18 by 26, and the two pairs of drivers are 4½ feet in diameter, which will bring the keys in the crank pin straps within about 4 inches of the dirt. The frame is straight, and 4 by 3¾ inches, the standard being 3 by 3¾, and 6 inches longer than usual. The "slab" part of the frame is in a single piece, "slotted" out in the center, so that the double slab form is retained with the advantage of being naturally united at the ends, which are riveted to the "jaws." The yokes, through which the crank rods play, are to be of one piece, instead of independent of each other as heretofore. Then side plates will be placed inside the drivers to make life secure in the cab in case of breaking tires.

The Iron Age.

New York, Thursday, May 23, 1878.

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CONTENTS.

First Page.—An American River Steamer—Performances of the Mary Powell.

Third Page.—An American River Steamer—Performances of the Mary Powell. (Concluded). Ohio Coals.

Fifth Page.—The Kennedy Spiral Punch Patent Self-Feeding Reamer. The Dangers of the Export Trade. The Phonographic Talking Clock.

Seventh Page.—The Ajax Lawn Mower. New Patents.

Ninth Page.—On the Estimation of Phosporus in Iron and Steel.

Eleventh Page.—A Model Iron Freight Steamer.

Fourteenth Page.—Modern Improvements in Europe. Holland and her Colonies. Solid Steel Castings.

Fifteenth Page.—Solid Steel Castings. (Concluded). The American Vertical Steam Engine. Extract from the Dutch Tariff. A New Torpedo Boat. Scientific and Technical Notes.

Sixteenth Page.—Industrial Items.

Seventeenth Page.—Industrial Items. (Concluded).

Eighteenth Page.—The Founding of Alloys.

Nineteenth Page.—Empirical Formula for Strength of Wrought Iron Beams, Channels, &c. Albert Borsig, the German Locomotive Builder. Secretary Evarts on the Export Trade.

Twentieth Page.—A Locomotive for War Purposes.

Twenty-first Page.—Trade Report. General Hardware. Iron. Metals. Coal. Imports. Exports.

Twenty-second Page.—Old Metals, Paper Stock, etc. Philadelphia. Pittsburgh. Chattanooga. Boston. St. Louis. Cincinnati. Baltimore.

Twenty-third Page.—Baltimore. (Concluded). Richmond. Louisville. Foreign. Our English Letter.

Twenty-fourth Page.—How the Yale Locks are Made.

Twenty-seventh Page.—The Iron Age Directory.

Thirtieth Page.—New York Wholesale Prices.

Thirty-first Page.—New York Wholesale Prices (Concluded).

Thirty-fifth Page.—Philadelphia, Buffalo Chicago and Pittsburgh Hardware and Metal Prices.

Thirty-seventh Page—Boston and St. Louis Hardware and Metal Prices.

The letter from a correspondent on the dangers of the export trade, published on another page, deserves careful attention. It deals with a side of the question which, in the general eagerness to secure foreign trade, is quite likely to be overlooked by exporters and manufacturers. In securing a large export trade we must be careful that it is upon a sound basis, otherwise more harm than pro may be expected from an extension of our foreign relations.

Modern Improvements in Europe.

The visitor at Rome and Pompeii in Italy, and at Malaga and Granada in Spain, is struck with the high degree of perfection attained in the hydraulic engineering of those ancient cities. Throughout the Roman Empire, and in the more important cities of Moorish Spain, public improvements such as sewers, aqueducts and water works were extensively introduced; in Seville, Granada and Pompeii nearly all the courtyards, even of the less pretentious private buildings, were graced with fountains, and the latter city was even capable of being flooded on the pavements of its streets through its entire length and breadth for purposes of cleanliness. Later on in the middle ages, and even in modern times, these public improvements nearly everywhere fell into decay; the people degenerated during the continual wars and civil turmoils, and the necessity of maintaining these works for the sake of cleanliness and public health was no more felt. Nor were the cities of this continent much better off than those of the Old World until within the past half century, when in England first, and in this country soon after, a reaction set in against the then existing system of execrable sewerage and the absence of public water supplies. The rapid increase of population in cities like London, New York, Philadelphia and Boston, loudly called for reform in conditions affecting the public health. The importance of good water came to be better appreciated, and public water works are again receiving the attention of the ablest engineers of the world. During the past 10 or 20 years the Europeans have been awakened to the desirableness, or rather necessity, of good water, and have freely incurred the enormous expense involved in such undertakings in cities, many of which were most unfavorably situated. In order to convey an idea as to what has been accomplished in some of the leading centers of population in Continental Europe, we have compiled a table showing the municipal expenditures of the following cities, which will assist us in ascertaining to what extent the expenditure in general has increased during a period of about 10 years:

MUNICIPAL EXPENDITURE.

Paris	1866..	$30,000,000	1877..	$44,000,000
Berlin	1865..	3,629,800	1875..	9,200,000
Vienna	1865..	5,400,000	1874..	13,500,000
Munich	1864..	940,000	1874..	1,068,000
Stuttgart	1864..	515,000	1874..	6,005,000
Breslau	1866..	924,800	1875..	1,697,200
Copenhagen	1865..	900,000	1874..	1,600,000
Florence	1866..	1,751,800	1875..	4,742,400
Rome	1871..	2,400,000	1875..	3,900,000
Genoa	1866..	1,544,200	1875..	2,332,000
Turin	1865..	2,044,200	1874..	2,500,000
Total		$50,049,800		$90,544,600

The foregoing shows that the general annual municipal expenditure in eleven of the greater cities of Continental Europe rose during the interval named about 80 per cent. The following table shows the increase of population:

Paris	1866..	1,825,000	1877..	2,000,000
Berlin	1867..	702,437	1876..	966,808
Vienna	1865..	550,000	1874..	670,200
Munich	1864..	167,000	1875..	193,000
Stuttgart	1864..	69,000	1871..	91,000
Breslau	1867..	166,000	1875..	234,000
Copenhagen	1870..	180,000	1875..	180,000
Florence	1866..	191,235	1875..	177,000
Rome	1871..	250,000	1875..	260,000
Genoa	1867..	166,000	1875..	234,000
Turin	1862..	214,715	1872..	212,644
Total		4,481,387		5,218,652

The population, it will be noticed, increased only about 16 per cent.

In the following table we show the public improvements, or extraordinary expenditure, in nine of the above cities, as compared with the general municipal expenditures:

		Extraordinary expenditure.	Total expenditure.
Berlin	1875....	$2,000,000	$9,200,000
Vienna	1874....	7,300,000	13,500,000
Stuttgart	1874....	5,267,200	6,005,000
Breslau	1875....	24,400	1,697,200
Copenhagen	1874....	320,000	1,600,000
Florence	1875....	1,354,200	4,742,400
Rome	1875....	1,000,000	3,900,000
Genoa	1875	852,800	2,332,000
Turin	1874....	628,600	2,500,000
Total		$18,747,200	$45,476,600

From what precedes it will be observed that about 41 per cent. of the expenditure in 1874-75 was of an extraordinary nature. Some of the cities named evidently went beyond their means, inasmuch as they undertook more than either the increase of population or the prosperity of the times warranted. Prominent among these is Florence, whose population since the government has been transferred to Rome has decreased instead of increasing, and Florence is now counted among the bankrupt cities.

Aside from these public expenditures in the shape of improved drainage, gas works, widening of streets, new promenades, parks, filling up of swamp lands and increase of public schools, there have been private undertakings on a vast scale in all these cities, prominent among which are horse-car lines, or "tramways," as they are called in Europe, originally introduced in the United States and a purely American invention. These, with scarcely an exception, have proved remarkably profitable all over Europe, and on many such lines steam is now gradually superseding horses. Elevated railways are not yet in Europe, except in a small portion of London, underground railroads and belt steam lines being thus far preferred. We feel confident, however, that the new system of elevated railways, such as we now have in this city, will spread rapidly to other American cities, and be also preferred in the near future in many cities of Europe topographically somewhat similar to New York.

An intelligent inspection of the modern improvements lately completed or in progress in the principal cities of Europe should, we think, meet the existence of a market there for an extensive and important line of American sanitary goods of various kinds. In the mechanics of hygiene it is probable that this country has made more progress than any other. Our plumbers' supplies, ventilating devices, heating apparatus, &c., are better and cheaper than many similar articles of foreign production with which they are likely to come in competition. It is probable that such goods will require some modification to adapt them to the peculiarities of European architecture, but the field is large and gives promise of profit, and an examination of it will probably well repay those of our manufacturers who, visiting Paris this summer, have time to study the architecture and home lives of the peoples of Europe.

Holland and her Colonies.

Holland is one of the most interesting countries of Europe, and her people command in a peculiar degree the respect of all civilized nations. With scanty means and against many and extraordinary obstacles, they have accomplished great and creditable results. Her history is full of chapters of which any nation might be proud.

First the great struggle against Philip II and his Spaniards, then the best soldiers of Europe, commanded by able generals and backed by all the treasure of Mexico and Peru, beginning in 1579, and with the exception of an armistice of some years, only finally terminated in 1648; next the innumerable wars with England, France, Spain and Portugal, chiefly naval contests; the incorporation of the Netherlands with France under Napoleon, and finally the separation from Belgium. During these struggles and changes Holland by turns won and lost colonies. At one time even Java passed out of her control and was in possession of the British from 1794 to 1814. Cape Colony and Ceylon, now found to be of such great value, she had to abandon to England—the former, with Demerara, in 1814, after forfeiting Ceylon in 1802. While fighting external enemies the German Ocean was constantly making encroachments on her shores, but discouraged by nothing the people of Holland have not only held their own, but have gained an enviable rank among modern nations, and at the present day are comparatively speaking the richest.

Instead of bending under adversity, the Dutch have profited by it. While the sword and flames devastated during the long war of independence the rich Southern provinces, of which Antwerp was the flourishing port, the Northern provinces not only stoutly resisted the Spaniards, but their vessels captured the treasure-laden galleons of Spain, while their privateers laid waste the coasts of Spanish America. In 1602 they founded the Netherland East India trading society and expelled the Portuguese from some of the most valuable colonies in the extreme East, such as the Spice Islands, Ceylon, Java, Sumatra, Celebes and Borneo. Those still in the possession of Holland form her greatest source of income, especially Java. The unparalleled prosperity of this colony is due to a great many circumstances, chief among which is the geographical position of the island on the great highway of Eastern commerce by sea. The island is moreover very fertile, well watered, not too mountainous, with an abundance of native labor, and produces everything grown within the tropics of an unsurpassed quality.

Although Dutch colonial management is not as much to be admired as that of England, for it is more narrow-minded and egotistical than the latter, it is undoubtedly the best next to that of England and France. At all events it has produced great results equally beneficial to the colonies and the mother country, and is gradually becoming as liberal as that of either England or France. At times the pressure on the natives has been a little too strong, leading to short wars like the late Achenese war in Sumatra, but considering the piratical leanings of these natives it is rather a matter of surprise than otherwise that Holland has been able to get along with them as well as she has, and that troubles are not more frequent.

The following are the present possessions under the Dutch crown:

	Square miles.	Populat'n 1872.
Holland proper	12,680	3,688,337
Colonies in Asia:		
Java, Madeira, &c.	51,336	15,573,000
Sumatra, Banca, Billiton and Palembang	116,175	2,254,000
Borneo, Western, Southern and Eastern Coast*	199,398	1,177,000
Celebes	45,710	341,000
Amboina, Ternate, Banda	42,943	366,000
Timor and small Sunda Islands	92,037	2,526,876
Colonies in America:		
Dutch Guiana	62,747	50,778
Dutch West Indies: Curacoa, Saba, St. Eustatius, St. Martins, Bonaire and Aruba	368	35,027
Colonies in Africa & Australia:		
Guinea Coast, Africa	10,630	120,000
New Guinea, Australia	68,000	200,000
Total	701,924	26,332,018

Since 1872 the population of Holland has increased to 3,809,327. In other words, a European population of about 4,000,000 holds in subjection, at a distance of thousands of miles, colonies numbering a population of, together, some 23,000,000, and has been doing a thriving business with them for centuries past. It has to be admitted that a nation able to maintain colonial sway so successfully over mostly barbarous nations in tropical countries, covering an area of 689,244 square miles, where warfare as we understand it is nearly impossible, must possess powers of government of the very highest order.

* The independent State of Sarawak, governed by the Englishman Brooke, contains 200,000 inhabitants.

On the 1st of January, 1877, there were in Holland 2688 primary schools and 1174 higher educational institutions. In 1826, when Belgium was still united with Holland, the Netherlands imported $14,400,000 worth of merchandise and exported $9,200,000; total trade, $23,600,000. After the separation from Belgium, Holland alone imported, in 1834, $17,200,000 and exported $12,400,000; together, $29,400,000. In 1872 the import was $179,830,000 and the export $153,570,000; together, $333,400,000. In 1875 the import had risen to $292,600,000 and the export to $227,920,000, constituting a total trade of $520,520,000. The high state of material advancement reached by Holland is best shown by the following statistics: The Dutch merchant navy is now composed of 1258 sailing vessels of a joint capacity of 366,284 tons, and of 110 steamers measuring 112,879 tons. There are in operation in Holland and the Grand Duchy of Luxembourg 1262 miles of railroad, which cost $113,254,192, or $89,741 per mile, and in the Island of Java 296 miles, costing $17,266,916, or $58,196 per mile. The number of post offices in Holland is 1243, which in 1875 distributed 55,000,000 letters and postal cards, and 36,000,000 newspapers, circulars and samples. Of telegraph offices there were, in 1875, 330; instruments, 379; operators, 1082; the telegraphic area was 19,725 miles; of lines there were 2064 miles, and of wires 7399; the number of messages sent was 2,198,000, or 578 messages for every 1000 inhabitants. In 1876 the number of instruments had increased to 397, and that of operators employed to 1121, while of messages there were 641 to the 1000 inhabitants. The proportion of letters forwarded in 1875 in comparison with telegrams dispatched was 25 letters to every telegram. On the 1st of November, 1876, the new canal connecting Amsterdam with the German Ocean was opened. This is a gigantic public improvement, resolved upon in 1865, a full description of which has appeared in these columns.

The great qualities of the Dutch are tenacity of purpose and untiring patience; they are, perhaps, less enterprising and active than most of their old commercial rivals, but once determined, after deliberate reflection, nothing discourages them. Throughout their political, colonial and commercial history we discover these great characteristics at every step, and they have been the secret of their astonishing deeds and extraordinary success. That with a nation so constituted and in possession of such rich colonies we should do a large and rapidly increasing business, is to be expected, considering our intimate relations with the Dutch during the past two centuries and a half. The following table shows our traffic with Holland and her colonies since the war:

	Holland.		Dutch West Indies		Dutch East Indies.		Totals.
	Import	Dom. Export	Import	Dom. Export	Import	Dom. Export	
1864...	1.33	3.43	1.00	1.05	0.69	0.12	7.62
1865...	0.78	3.01	0.59	1.54	1.08	0.13	7.13
1866...	2.78	2.41	0.73	1.13	0.78	0.16	7.99
1867...	1.59	2.97	0.70	0.85	2.64	0.20	8.95
1868...	1.27	4.62	0.81	0.93	1.90	0.14	9.67
1869...	2.69	3.94	1.00	0.93	1.95	0.13	10.64
1870...	1.35	6.12	0.73	0.94	2.55	0.16	11.85
1871...	2.05	12.40	1.06	0.84	3.04	0.20	19.59
1872...	2.55	11.01	1.07	0.79	7.33	0.11	22.86
1873...	2.94	10.84	1.19	0.95	7.56	0.26	23.74
1874...	2.52	13.71	1.65	0.99	3.86	0.45	23.18
1875...	2.35	7.48	1.52	0.85	6.78	1.03	20.01
1876...	2.44	12.19	0.70	0.87	5.99	0.63	22.82
1877...	2.55	10.41	0.74	0.97	4.51	2.67	21.85
	29.19	104.54	13.49	13.63	50.66	6.39	217.90

Recapitulation.

Import	$93,340,000
Export	124,560,000
Total	$217,900,000

EXPORT OF DOMESTIC GOODS TO HOLLAND.

	—Fiscal Years.— 1876	1877.
Agricultural implements	$54,196	$26,417
Cattle and horses	.....	35,560
Potashes	4,295	4,109
Bark	10,431	3,425
Breadstuffs	2,973,845	874,457
Carriages	8,190	15,136
Iron	70,498	3,618
Copper	.....	78,175
Cotton	4,284,110	3,209,579
Cotton fabrics	21,097	2,721
Drugs	13,906	11,612
Dyes	48,039	29,995
Fancy goods	1,007	4,170
Dried apples	3,620	248,694
Horsehair	7,935	.....
Manufactures of hemp	18,004	2,388
Hides	.....	9,940
Leather and leather ware	131,235	86,525
Hops	.....	30,499
Stoves	3,224	197
Machinery	51,608	40,548
Hardware	26,931	19,700
Manures	3,296	8,040
Marble	.....	3,974
Naval stores	177,657	199,231
Petroleum	1,589,142	1,752,652
Lubricating oil	37,728	120,517
Essential oils	4,118	4,316
Provisions and tallow	937,705	1,415,458
Seeds	11,749	.....
Soap	1,430	.....
Sperm	1,700	1,110
Spirits of turpentine	149,530	73,460
Starch	34,236	54,295
Leaf tobacco	1,198,502	1,595,517
Manufactured tobacco	34,332	40,337
Timber, lumber and staves	122,486	127,670
Furniture	5,561	13,111
Wooden ware	9,365	18,983
Stationery	.....	4,140
Plated ware	.....	2,017
Sewing machines	.....	1,131
Fire engines	.....	1,840
Clothing	.....	1,775
Other goods	134,653	231,728
Total	$12,185,355	$10,411,757

EXPORT OF DOMESTIC GOODS TO THE DUTCH COLONIES.

	—Fiscal Years.— 1876.	1877.
Breadstuffs	$284,816	$355,116
Blacking	.....	1,011
Candles	4,485	2,673
Carriages	5,947	3,809
Brooms	1,100	1,190
Cordage	5,854	7,538
Cotton fabrics	14,499	35,456
Drugs	7,206	8,612
Preserved fruit	1,835	1,775
Glassware	1,236	5,795
Hay	1,545	3,061
Ice	9,105	17,270
Machinery	2,355	1,029
Hardware and guns	8,384	6,283
Oakum	.....	1,222
Leather and leather ware	11,367	11,769
Matches	3,431	3,723
Perfumery	.....	1,760
Tar and pitch	732	1,586
Petroleum	644,086	2,638,700
Lamps	.....	3,097
Provisions, fish and tallow	308,213	329,446
Vegetables	4,745	6,802
Soap	3,617	3,754
Refined sugar	5,068	9,143
Tobacco	62,405	46,648
Lumber, timber and wooden ware	46,280	36,674
Scales	.....	2,617
Trunks	.....	1,410
Other goods	68,797	85,237
Total	$1,507,118	$3,634,215

The shipments of petroleum to Java alone have, from $619,891 in 1876, risen to $2,600,646 in 1877, nor has there been any abatement in these shipments since. Large fortunes have been realized in this particular trade.

The exports from Holland proper consist of fish, butter, cheese, refined sugar and gin; from the Dutch East Indies of indigo, coffee, sugar, cinnamon, sago, pepper, cloves, nutmegs, mace, rice, tobacco, wax, hides and tin. From Curacoa we receive dye woods, hats, salt, goats' skins, and some goods produced on the Spanish Main.

Of iron and steel in various shapes England exports to Holland large amounts, as the following statistics will show in detail:

BRITISH EXPORTS OF IRON AND STEEL TO HOLLAND.

	1876.	1877.
Hardware and cutlery	$505,935	$441,320
Pig iron	3,655,680	2,940,265
Bar, &c., Iron	262,965	196,500
Hoops and armor plates	721,105	577,085
Cast and wrought Iron	1,130,335	640,135
Machinery	1,287,385	941,655
Total	$7,563,405	$5,736,960

The item of machinery is quite important, but it is impossible to determine whether that sent from England has been all for Holland or whether in part it has gone in transit to Germany. Rotterdam, in particular, is, through its various steamship lines, receiving a great many goods from England and elsewhere intended for Rhenish and Northwestern Prussia. We are very much inclined to believe that the bulk of these iron and steel imports do not remain in Holland.

The Dutch are not a manufacturing nation, but in the products of the dairy, in sugar refining and in distilling they have attained great skill. Their madder industry, once of great importance, has been killed by artificial dyes of recent invention. Strictly speaking, the Dutch are a trading nation, and as we manufacture so many goods now rapidly gaining a foothold in Europe, we ought to be able to sell them considerable, especially hardware and agricultural implements. The Dutch duties are very moderate, and as the Dutch are fond of good quality in everything and are able to pay for it, the superiority of our goods should secure for them a profitable market in Holland and her colonies.

Solid Steel Castings.

A great barrier to the introduction of steel for constructive purposes has been found in the difficulty met with in counteracting a tendency toward defective homogeneousness in the so-called "low" steels. On account of their great strength and ductility, these steels would be eminently fitted for many engineering uses if it were possible to devise other means of correcting their defects than by forging and hammering, while an inestimable advantage as regards facility of giving it at once its working shape would be gained if steel without blow-holes and malleable could be poured into molds. "Mild" or "low" steel containing a small amount of carbon only, is not as liable as the hard steels to the destructive action of internal strains, but its homogeneousness is commonly defective on account of the presence of blow-holes. A steel will generally flow better while casting the more it is carbonized, and it is probable that the greater fluidity of hard steels permits a freer escape of the gases, which there are good reasons to believe cause blow-holes. In the decarburization of pig iron by the modern processes of making steel, the carbonic oxide formed by the reaction of carbon upon oxide of iron remains in solution in the metal, escaping partially only during the cooling period, when the solubility rapidly diminishes. The presence of the imprisoned bubbles of carbonic oxide affects the mechanical properties of the metal, and calls for some means of removing or preventing it. Rolling, forging or hammering, though rendering the metal more compact, are expensive processes. Great pressure upon the metal in a molten state was successfully introduced by Whitworth, who uses the hydraulic press, while others have recommended steam. Nessel and other metallurgists, starting from another point, sought to gain their object by aiding the expansive force of the gases by causing the formation of a vacuum above the fluid metal. These methods, by which the object in view is attained by mechanical means, though experimentally successful in the production of a solid ingot, did not open to the metal that wide range of application which lines of experiments based upon chemical inquiry showed to be possible. While the former sought a remedy, the latter, attacking the root of the evil, succeeded in detecting a preventive. Hard steel castings without blow-holes have for some time been produced, chiefly by Krupp and by some Sheffield firms, but it is only recently that soft steel fit for industrial and structural purposes has been cast without the defects which the material is so liable to suffer from. By a long series of experiments, ably con-

ducted and persistently renewed, the history of which is given by Mr. A. L. Holley in the May number of the *Metallurgical Review*, the engineers of the Terrenoire Company have gradually developed the manufacture of a malleable metal which, after annealing, has the physical qualities of forged steel. Its average tensile strength in a cast annealed state is as follows: Hard steel, 47.51 tons per square inch and 8.1 per cent. elongation; medium steel, 46.92 tons per square inch and 14.6 per cent. elongation; soft steel, 31.72 tons per square inch and 25.3 per cent. elongation.

The process consists of the formation of an initial bath of manganiferous pig, to prevent oxidation during the process. Then such softening or decarburizing materials as wrought iron are dissolved in the bath, and toward the end of the operation, which is determined by a series of slag and metal tests, silicon and manganese are added in the shape of a special pig, in such order and proportion as to prevent the formation of blow-holes while casting, and at the same time to give to the steel certain special physical qualities. The material used for the initial bath varies according to the grade of steel to be produced; thus a hard steel requires 11 to 14 per cent. of manganiferous pig, holding from 6 to 8 per cent. of manganese, while soft steel is made from an initial bath containing as much as 14 per cent. of manganese. Oxidation during the whole process must be kept as low as possible, and all means must be employed to prevent cooling the bath. The decarburizing or refining materials must therefore be preheated. They are chosen with reference to the quality of the product arrived at, and may be Bessemer or open-hearth scrap, fountains from previous castings, puddled bars or direct blooms, the proportion varying from about 78 per cent. for hard steel to about 72 per cent. for soft metal. The final addition, too, is different, according to the product; for hard steel it usually consists of 11 per cent. of special pig containing 3.5 manganese, 3.0 carbon, 4.2 to 4.1 silicon and 0.1 phosphorus; for soft steel from 3½ to 4 per cent. of the entire charge of a pig holding 1.6 carbon, 14 per cent. manganese, 75 per cent. silicon, and 0.12 phosphorus. The chemical reactions to which the favorable action of the special pig upon the quality of the metal is due, are as follows: The silicon prevents blow-holes by decomposing the carbonic oxide; the manganese reduces the oxide of iron and prevents a further production of gases by the reaction of this oxide on the carbon; the silica formed produces silicate of iron, which is rendered more fusible by the formation of a double silicate of iron and manganese. The steel contains notable amounts of manganese and silicon, which, as they undoubtedly impart special qualities to the metal, must be closely maintained. The following are the averages of 6 and 12 charges:

1.	0.945 Mn.	0.560 C.	0.340 Si.
2.	0.880 Mn.	0.500 C.	0.390 Si.

It is therefore indispensable, in order to know the chemical composition of the bath, to keep oxidation under control during the whole operation. Only by this means can the exact amount of the special pig to be added be ascertained. The metal produced by the Terrenoire process may be cast into any desired shape and requires only slow annealing. It is, therefore, eminently fitted for armor plates, guns, projectiles, heavy parts of machinery, rolling-mill machinery, &c. The novelty of the process consists in the employment of definite proportions of manganese and silicon at regulated times during the operation. Its extraordinary qualities and the low price at which it will be possible to produce it insure for the steel made by the Terrenoire process a rapidly increasing sphere of usefulness.

The American Vertical Beam Engine.

Upon the first page of this issue will be found an illustrated article upon the performances of the American vertical beam river engine. It is from the pen of the late Theron Skeel, M. E., a clever young engineer of this city who gave promise of a bright future. The article was placed in our hands but a few weeks before his death, and is peculiarly interesting and valuable for several reasons. Heretofore we have had no data in regard to the performances of the well-known American vertical beam engine as applied in vessels. These engines, with their long stroke and high piston speed (in the case of the Mary Powell it sometimes reaches 600 feet per minute), run several years with very moderate expense. Their durability is wonderful, all the moving parts being hung, as it were, from the main center, and in balance they adjust themselves to all sorts of conditions. It is a sort of tradition that a beam engine in a steamer never wears out. The vessel may be broken up and the engine sold for old iron, but it never seems to reach a point where it cannot go on with its regular work. It has long been known that these engines were very economical. Prof. R. H. Thurston, in his report upon the Vienna Exposition, says of this form of engine that "it is only excelled in economy by the best compound engines." The fact of its economy, while well established, was only known through the general results of coal and repair bills.

The figures obtained by Mr. Skeel have a much higher value than those commonly reached by taking account of fuel, power, &c., for a single trip. The trials practically extend over three years, and the results are those which can be obtained commercially through a series of years. We are doubtful whether the best compound engines could show any better results if they were tested by the performances of a year or two instead of for a single racing trip when fresh from the builders.

Evidently the beam engine, for a light paddle boat, cannot be radically improved. The large wheels, driven at a high rate of speed; the long stroke, with long connecting rods; the perfect balance of the reciprocating parts—all contribute to this result, while the small internal friction of the engine due to this design adds to it considerably.

Mr. Edward Riley's paper on the "Estimation of Phosphorus in Iron and Steel," of which we print a synopsis in another column, will be found of much interest. The importance of accurate methods for the qualitative analysis of iron and steel can hardly be overestimated, and everything tending toward greater accuracy should have the most careful attention. Mr. Riley's experiments show conclusively that the ordinary methods of analysis give phosphorus determinations which are much too low. His own method, however, shows much closer results, and as his experiments were made in many cases with samples containing known quantities of phosphorus and the analyses were made by experienced chemists, the results attained seem worthy of confidence.

Extract from the Dutch Tariff.

* Iron: Pig, old, scrap, bar, rod, wire, rails and pipe, free; all other wrought iron and hardware, 5 per cent.; manufactures of steel, 5 per cent.; copper, free; finished copper ware and gilt wire, 5 per cent.; lead, free; plumbago, 5 per cent.; lead pencils, 5 per cent.; spelter and zinc, free; zinc ware, whether lacquered or not, 5 per cent.; tin plates and tin ware, 5 per cent.; platina, ditto ware and wire, per lb., 4c.; plated ware, 5 per cent.; aluminium, 5 per cent.; ammunition, such as guns, pistols, sabres, swords, bayonets, bullets, cartridges, and percussion caps, 5 per cent.; cannon of gun metal, 100 lbs., $3; ditto, iron, 100 lbs., 50c.; ditto balls, 100 lbs., 30c.; bronze ware, 5 per cent.; chirurgical instruments, musical and all scientific ditto, 5 per cent.; gold and silver wire and ware, 3 to 5 per cent.; ditto fringes, &c., 5 per cent.; polishing powder, 5 per cent.; grindstones, 5 per cent.; gold and silver watches and movements, 5 per cent.; gold and silver leaf, 3 per cent.; clocks and movements and clock cases, 5 per cent.; glass and glass ware, 5 per cent.; earthenware, 5 per cent.; camphene, petroleum and lubricating oil, 100 lbs., 22c.; lamps and shades and lanterns, 5 per cent.; needles, 5 per cent.; steel pens, 5 per cent.; sieves, 5 per cent.; india rubber and gutta percha goods, 5 per cent.; brush ware, 5 per cent.; printing ink, 5 per cent.; tallow candles, 100 lbs., $1.20; wax, sperm and composition ditto, 5 per cent,; linseed cake, free; toys, 5 per cent.; matches, 5 per cent.; furniture, 5 per cent.; tools made of wood, iron and steel, free; hides, skins and leather, free; prepared ditto and leather manufactures, 5 per cent.; saddlery, 5 per cent.; cordage, free; prepared furs, 5 per cent.; paper of all sorts and paper hangings, 5 per cent.; ink, 5 per cent.; blacking, 5 per cent.; carriage material, 5 per cent.; varnish prepared with oil, 5 per cent.; ditto, with 50 per cent. alcohol, 100 lbs., $1.40; stone, free; vessels and boats, 1 per cent.; wood, free; cooperage and wooden ware, 5 per cent.

A New Torpedo Boat.

The attention of the British Admiralty has recently been called to what is termed a "Fish Torpedo Boat," of curious design, for the purpose of working under water, and intercepting the Whitehead and other torpedoes. A complete model, more than eight feet in length, being one-twentieth of the full-sized boat, has been made and satisfactorily tested. It may be stated that the original design was made by the late Lord Milton, who was a skilled mechanic, and worked at his trade, assisted by Mr. Turner, of Wentworth. The design was left in an uncomplete state for some time, but lately it has been taken up by Mr. Turner and Mr. White, of Thorpe, near Rotherham, who have made several additions and improvements. The boat in every way represents a monster fish, and is worked by compressed air. In the fore part there are two large eye holes, which, when the boat is under water, sends out a powerful electric light that will show the keel of a vessel, or a torpedo, a long way off. The tail plays an important part in the machine, being not only the propeller, but being perforated on either side expels the water and foul air. In the front there is a ram of sufficient power to penetrate an ordinary war vessel. Where the nostril of the fish should be there is a revolving gun, worked by hydraulic power, and fired by electricity with a new explosive. The model is without masts, the deck being not only clear of obstructions, but air tight. The interior of the boat is divided into compartments, and can be sunk to any required depth by taking in a certain quantity of water, which is admitted by an arrangement at the bottom. This can be expelled, and the boat then rises. Each compartment is supplied with compressed air, and sufficient can be procured to supply the wants of three or four men—sufficient for working the boat—for from three to ten hours at a time. When submerged the boat can be propelled at the rate of 18 knots per hour. The gun is a very peculiar one, and was the invention of the late Lord Milton. It is rotary, having four chambers placed like the spokes of a wheel, so that while one shot is being fired a second chamber could be charged, a third sponged, and a fourth cleaned, so that the discharges follow each other in rapid succession.

* The guilder has been calculated at 40c.

Scientific and Technical Notes.

A startling discovery, says *Engineering*, has recently been made by Hughes that certain unhomogeneous conducting substances placed in circuit with a battery possess the property of

CONVERTING SONOROUS VIBRATIONS INTO UNDULATORY CURRENTS OF ELECRICITY,

by which not only can notes and articulate speech be transmitted to a distant telephone placed in the circuit, but sounds so minute as to be otherwise inaudible can be magnified into loud noises. One of Prof. Hughes' most interesting experiments is the following: A glass tube is filled with a mixture of metallic tin and zinc, commonly known as "white silver powder." This powder is slightly compressed by two plugs of gas carbon inserted at the ends, to which are attached wires having a battery and a galvanometer in circuit. The plugs are cemented in their place by being covered over with ordinary sealing wax. Upon grasping this tube by the two ends and giving it a tensile strain by pulling the two ends in contrary directions, but in a line with its length, the galvanometer needle is deflected in one direction, and on pushing the ends toward one another the needle of the galvanometer is instantly deflected in the opposite direction. In this case the finely divided metallic particles forming the contents of the tube are brought into more intimate connection by compression, and are more separated during the operation of extension, and thus the resistance of the circuit is varied, increasing the current in the first instance and decreasing it in the second. This experiment alone would be a remarkable example of the marvelous sensitiveness as a detecter of minute variations of electrical force, for it is hardly possible to conceive the minute increment that takes place in the length or capacity of a glass tube some 3 inches long when extended by pulling with the fingers. But this tube is far more sensitive still. If the tube is attached to a box opened at one end, serving as the mouth-piece of the instrument, and the wires are connected to a distant bell telephone having a battery of three Daniell cells in circuit, the sounds are so loud that it is possible to sing into one instrument and hear at the same time singing from a distant station in another. The most sensitive of a series of apparatus invented by Prof. Hughes is, however, the following: It consists of a small pencil of gas carbon pointed at each end and lightly supported in a vertical position between two little cups scooped out of the surface of small carbon blocks which are attached to a thin vertical sounding board secured to a more solid base. The carbon blocks are connected by wires to the battery and line wire leading to a distant telephone. This marvelously simple apparatus not only takes up and transmits articulate speech with great power and distinctness, but it detects and converts into loud noises the minutest possible vibrations. Even the very footfalls of a little common house-fly, as it walks along the board, are heard with unmistakable distinctness by a person whose ear is at the telephone, which may be miles away.

A patent has been granted to Dr. C. Loewig, of Breslau, Germany, for an improved process for the manufacture of

CAUSTIC ALKALIES AND ALUMINA.

For the production of hydrate of alumina, manufacturing chemists have hitherto prepared aluminate of soda either by the use of cryolite and lime or the employment of bauxite and carbonate of soda. By introducing carbonic acid gas they precipitated hydrate of alumina from the solution of such aluminate of soda, at the same time obtaining or regaining the soda as carbonate of soda. Dr. Loewig now alters this process in such a manner that instead of obtaining carbonates of alkalies he obtains caustic alkalies. He heats carbonate of soda or potassa to red heat with so much alumina or alumina ore as to present one equivalent of alkali to one equivalent of alumina. In this manner by solution and subsequent lixiviation aluminate of soda is obtained which is entirely free from carbonate of alkali. This product is decomposed by the addition of a pulpy paste of hydrate of lime, of hydrate of strontia, or of hydrate of magnesia, whereby the aluminates of said earths will be formed as precipitates, the caustic alkali remaining in solution. Three equivalents of the earths to one equivalent of alumina are required for precipitating the entire alumina from the alkaline aluminates. The solution of the caustic alkali is evaporated (by preference in a vacuum pan, in order to avoid the absorption of carbonic acid from the atmosphere), and finally heated in an iron caldron, in order to produce the dry hydrate. In the employment of the aluminates of the earths, the production of a new and important preparation—the gelatinous hydrate of alumina—may be obtained in an economical manner. By way of preparing this alumina from the aluminates of the earths, they are permitted, after having been agitated in much water, to flow slowly into muriatic acid, and after neutralizing the latter so much aluminate is added that the entire alumina of the aluminates applied will be separated, which is easily achieved. It is merely necessary to observe that the same must not take place at a high temperature, because alumina precipitated in a warm state possesses less discoloring or active qualities than when precipitated in a cold state. Hence it is necessary to cool down the solution of the aluminate, warmed by the reactions, before proceeding to separate the alumina. After this process the alumina is washed with water in a suitable apparatus—for instance, in a filter press—until it is free of the chloride compounds, and finally subjected to considerable pressure.

Mr. Elbridge Wheeler in a note on

IRON AND STEEL IN COMBINATION

says: When we consider the two great interests of to-day—in iron upon the one hand and steel upon the other—both contending for the mastery in supplying the great industrial wants of all civilized nations, and believing, as we do, unless united or combined together, in distinct lines and proper proportions, the full benefits of either, or both can never be obtained, we feel it to be our duty to do all we can to accomplish such a result. As well might we contend that any one of the many different woods will answer the purpose of all the known woods, as that steel can take the place of iron, or iron the place of steel—"it is not in the wood." It is well known that iron when crystalline will fracture like steel, and when not crystalline will show fiber; and that no steel, however low in grade, can be fractured upon one side without a separation of the bar, while one of fibrous iron can be fractured on one side and the opposite side remain unbroken; hence we contend that notwithstanding steel has greater tensile strength than wrought iron, it is more liable to sudden fracture, and every smith is aware that he cannot forge steel as he can iron, but that it requires the greatest care, and can be welded only with fluxes, while iron furnishes its own flux. No engineer has yet ventured to place a steel bar in position where severe vibratory strain would be put upon it, of less weight than of iron, to perform the same office. Now, if steel has double the resisting power of iron, why not reduce the weight per foot to one-half that of iron, and then certain grades of steel would be to the consumer twice as cheap as iron. No one doubts the superior wearing qualities of steel over iron under friction, or that it takes less motive power under pure friction to propel steel than iron. As steel has greater wearing quality, less friction, greater tensional and torsional strength, why not displace iron? Simply from the fact that iron has qualities that steel does not and cannot possess, namely, fiber and tenacity, which are the necessary qualities to make steel all that could be desired. Again, we say that to obtain the durability, the tensional and torsional strength of steel and the safe and reliable qualities of iron in one and the same bar, we must unite the one with the other, and we have the properties and qualities of the two metals combined.

A process, depending like that of Professor Barff on the formation of an unalterable magnetic oxide, for the

PROTECTION OF IRON AGAINST OXIDATION,

has been patented in England by Mr. George Bower, of St. Neot's. The means by which he accomplishes the desired end is, however, in every way different from that used by Prof. Barff. It is well known to every tyro in chemistry that if we pass steam over red-hot iron the steam is decomposed, hydrogen being set free, while the oxygen goes to the iron to form the stable magnetic oxide (Fe_3O_4). On this reaction depends the process of Professor Barff, who places the articles in a heated chamber, and then passes in superheated steam, for a time dependent, of course, on the thickness of the film required. Mr. Bower has, however, discovered a process that will most efficiently coat the iron, and at the same time simplifies the whole of the working details. The agent he employs is the oxygen of the atmosphere. The articles are placed in a chamber constructed of fire-brick or iron, and fitted with inlet and outlet pipes; air is passed in, and the chamber closed as completely as possible. The temperature is then raised to the requisite degree, which varies with the nature of the articles, and which ranges from a dull to a bright red heat. At the end of every hour the inlet and outlet pipes are opened, and the air renewed, the pipes being again closed. This process continues until the required thickness of oxide is formed, which will, of course, depend on the purpose for which the articles are designed. The cost of thus protecting iron depends simply on the amount of fuel used, with the labor and wear and tear of apparatus involved; so that the process has, it is claimed, the advantage of being the cheapest as well as the most effective yet brought before the public. The coating has been severely tested, both as to hardness, homogeneity, and capability of withstanding all the ordinary oxidizing influences likely to be brought to bear on it, and has not been found wanting. It is found that the process, as at present carried out, answers best with cast iron; but, with a cheap and easily applied modification, the details of which are not yet made public, it is found to answer equally well for all other descriptions of the metal.

M. Arson, of the Société des Ingénieurs Civils, lately read a paper before that institution on a

FURNACE FOR REHEATING TIRES

for wagons, &c. The bending and welding of these iron rings has given origin to many interesting apparatus and processes. Those employed by the Compagnie des Omnibus of Paris, by the Compagnie des Petites Voitures, and by the workshops of M. Colas, are well known to French Engineers, but do not seem to realize all possible advantages. The heating is unequal, requires much fuel, is slow, and needs much hand labor. The solution of the problem has received attention from the Parisian Gas Company, with satisfactory results, which we condense in as few words as possible. The appliances consist in a reheating furnace and a receiver, along with two light and very easily worked cranes. The furnace is lenticular in shape, and of the reverberatory type. The base is cylindrical, with central fire-place. The hearth is closed by a moveable cover, suspended by chains passing over pulleys, and balanced by counter weights. While operations are proceeding, the products of combustion are thrown back by the roof, and find no other means of exit, except through openings in the hearth, so that they are forced to envelop the hoops to be heated, after which they escape underground, being drawn back by the action of a neighboring stack. The receiver is a cast-iron basin, in which the wheels are placed, solidly attached. The water necessary for cooling the hoops, after they are let on, reaches this receiver by three various openings so as to facilitate the rapid cooling of the tire. In the center is placed a valve for emptying the receiver. As soon as the furnace has reached a working temperature—two hours after lighting—it only takes seven minutes to obtain the necessary heat for tires measuring 5.75 feet in diameter, 3 inches wide and 1 inch in thickness. Heavy tires of the same diameter, but 4 inches wide, and 2 inches thick, require 15 to 18 minutes to reach a temperature of from 1112° F. to 1292° F. In order to save time and labor, several tires of different diameters are heated simultaneously. The crane can be allowed to penetrate between the movable hood and the body of the furnace, so as to pick out any desired tire without interfering with the others. Just after one of the cranes has lifted out a tire the other crane immediately lets in another to take its place, and the hood is let down as rapidly as possible. The working of this furnace as well as the operations of loading, unloading, shrinking and adapting the wheels in the receiver, need the employment of 10 hands and a foreman. The fuel used consists principally in lumber and shavings obtained from waste material and repairs. M. Arson states that such a furnace as he has described is only applicable in cases where a large amount of work has to be done—at least 100 wheels per day; but in such cases the results obtained are highly economical and satisfactory.

In the *Sitzungsberichte der Böhmischen Gesselschaft der Wissenschaften*, M. F. Stolba describes a process for

NICKEL-PLATING IRON AND STEEL BY IMMERSION.

The operation is very simple. To a dilute solution (5 to 10 per cent.) of chloride of zinc, as pure as possible, a sufficient amount of sulphate of nickel is added to color the solution green, which is then boiled in a porcelain dish. Without paying any notice to the precipitation of a basic salt of zinc the objects to be coated are introduced into the bath (after having been perfectly freed from all traces of grease or rust), care being taken to keep each object isolated. The whole is kept boiling from 30 to 60 minutes, water being added to replace the loss by evaporation. The nickel precipitates on all the clean surfaces of metal, in the shape of a white brilliant coat, which a longer period of boiling does not render any thicker. The objects taken out of the bath are washed with water holding a little chalk in suspension, after which they may be polished if desired. The chloride of zinc must contain no metal which is precipitated by iron. It is best specially prepared for the purpose desired. A point to which particular attention must be given is that the sulphate of nickel is free from copper. By replacing the sulphate of nickel by sulphate of cobalt a coating may be obtained whose aspect differs but little from that of burnished steel, which adheres firmly to the metal.

A new and simple method of

TESTING GREASE AND OIL FOR ACIDS

is recommended by Dr. Wiederhold to those who use either grease or oil as lubricators for machinery. Either cuprous oxide or coppersmith's scale is put into a small test tube, which is filled with the oil to be examined. If the latter contains no fatty or resinous acids there is no change in its color, but if there is any the oil is colored, becoming light green in its lower portion within a short time, if the amount is small, the intensity of the color varying with the amount of the acid. Oil containing resinous acids is turned blue. These reactions appear within 10 to 20 minutes at an ordinary temperature. They are accelerated, however, by the application of heat. This method is far superior to most of those proposed, as it is very readily and easily employed. Dr. Wiederhold states that the action is so striking that it cannot be mistaken by any one, even though the experiment were made for the first time. The coloring of the oil is probably due to the fact that the fatty and resinous acids decompose the cuprous oxide, metallic copper and cupric oxide being formed. The latter enters into combination with the acids and produces salts which, dissolving in the oil, give it a green or greenish blue color.

For the purpose of

COATING METALS WITH TIN,

Messrs. Neuburg & Co., of Vienna, propose to use a zinc and carbon battery. The inner cell containing the carbon is half filled with chromic acid, and the outer cell containing the zinc is filled with dilute sulphuric acid. The articles to be coated with tin are put into a bath composed of protochloride of tin and cream of tartar, with or without chloride of tin. The proportions of these ingredients are: Eight parts of protochloride of tin, 16 parts of cream of tartar, and two parts of the chloride, if the latter is used. When it is present the tin coating is effected more rapidly, whereas when the bath is composed of protochloride of tin and cream of tartar only the tin coating is very white, but is not produced so rapidly as when the chloride is used. These ingredients should be dissolved in about 100 gallons of distilled water. The black plates are first "pickled" in any suitable manner, and then immersed in the above-described bath or solution, and are allowed to remain in the same for a longer or shorter time, according to the thickness of the deposit or coating of tin required on the plates. While in this bath the plates or other pieces to be coated are connected by a wire with the positive end of the battery, while the negative end of the battery is connected with a piece of tin hung in the same bath. When the plates or other pieces or articles have been sufficiently coated with tin they are held over a fire in order to give the tin a lustrous appearance.

A monster locomotive is building at the Springfield shops of the Boston and Albany road. Its weight will be about 40 tons. The boiler is 10 inches longer than the standard, with 173 flues—11 above the ordinary number and 4½ inches longer—12 feet 3 inches long and 2 inches in diameter. Of the inside fire-box the side sheets are 60 by 60 inches, and the flue and door and crown sheets 60 by 42 inches. The total area of heating surface is thus 455 17-24 square feet, not considering the forward flue sheet. The cylinders, with 8 by 15/8-inch ports, are 18¾ by 28 inches, the largest heretofore being 18 by 26, and the two pairs of drivers are 4½ feet in diameter, which will bring the keys in the crank pin straps within about 4 inches of the dirt. The frame is straight, and 4 by 3¾ inches, the standard being 3 by 3¾, and 6 inches longer than usual. The "slab" part of the frame is in a single piece, "slotted" out in the center, so that the double slab form is retained with the advantage of being naturally united at the ends, which are riveted to the "jaws." The yokes, through which the crank rods play, are to be of one piece, instead of independent of each other as heretofore. Then side plates will be placed inside the drivers to make life secure in the cab in case of breaking tires.

INDUSTRIAL ITEMS.

MAINE.

It is rumored that the Evans Rifle Co., of Mechanics Falls, is filling large orders for the Russians on the steamer Cimbria.

MASSACHUSETTS.

R. Estabrook & Son's iron foundry at Boston was burned week before last; loss $15,000, partially insured.

CONNECTICUT.

The Phœnix Iron Works, at Hartford, are very busy in their foundry department. They have the contract for furnishing the ironwork for the new Trinity College buildings, an important part of which contract consists of 800 iron window frames and sashes. These are designed after English models, and are the first of the kind ever manufactured in the United States. The sashes are swung on hinges, and in opening are adjustable on a quadrant, by springs. This firm also furnished the ironwork for the new Capitol at Hartford, now approaching completion; also for the Charter Oak and Connecticut Mutual Life Insurance Companies' buildings, and other fine structures in Hartford and elsewhere. Their facilities for the manufacture of machinists' tools are also very complete, and their product in this direction has been large in amount and commendable in quality.

Between six and seven hundred of the Bridgeport cartridge shop employees received notice of dismissal Saturday night, the 11th inst. This reduction in the number of hands is mainly due to a falling off in the supply called for by the Turkish government, only about 100,000 cartridges a day being now turned out under that order, against half a million per day a short time ago.

The Hartford *Courant* has the following in regard to the Malleable Iron Company: The financial embarrassment of the company during the winter and the settlement with creditors on terms affording a continuance of manufacturing, is still fresh in every mind, and the wisdom of the course then pursued is now evident. Not only is business daily increasing with the company so that a corresponding increase of help is necessary from time to time, but all back wages due employees up to May 1st will be paid in full. The amount requisite is nearly $14,000, but the happiness assured to over 200 hands and gain to Meriden's prosperity cannot be so well estimated.

Tuesday morning, the 14th inst., one of the buildings of the clock factory of Samuel Peck & Co., on Day street, New Haven, was nearly destroyed by fire. The owners of the property were the Scoville Manufacturing Co. of Waterbury. The loss is $25,000, well insured.

A new company, known as the Vulcan Iron Works, has recently been organized at New Britain. The officers are H. M. Dates, president, Theron H. Camp, secretary and treasurer, and Isaac Rulofson, superintendent. New works are now in course of construction on the line of the Springfield, Hartford and New York Railroad. The foundry is circular in form, and 400 feet in circumference. The annealing room 50x70 feet, and the rolling and finishing room 17x32 feet; smoke stack 127 feet high. The boiler is 50horse-power, of the Babcock & Wilcox water-tube type. It is to be fired with the waste heat from their two annealing kilns. Malleable and gray iron castings are to be their product and the works are expected to go into operation in July.

Dunbar Brothers, of Bristol, are running full force, 10 hours, on clock springs and small springs in great variety, from the best steel plate. The clock business is fairly active.

The Eaton, Cole & Burnham Company, manufacturers in brass and iron of steam, gas and water goods, are running with a full complement of hands and speak encouragingly of immediate future prospects.

The Bridgeport Brass Company report business improving. Fowler's patent fly fan is being largely manufactured by them, 1200 having been sold in the last 30 days.

Reynolds & Co., of New Haven, have made some additions to their shops and are running full, on set, cap and machine screws, machine bolts and coach screws.

The Farrell Foundry and Machine Co.'s works at both Waterbury and Ansonia are active and full of orders on home and foreign work. They have in hand large orders for sugar-mill machinery for Cuba and the Sandwich Islands, requiring their running extra time.

NEW YORK.

Mr. F. Haberman is running his factory at the corner of York and Adams streets, Brooklyn, full time with over 300 hands. He is turning out all sorts of stamped, pieced, and japanned house furnishing goods. The weekly consumption of tin amounts to over 600 boxes. Besides this a large quantity of the best American charcoal black plates is used for such work as is made up before retinning. The factory, which is a very large one, has a complete outfit of fine presses, and besides the usual line has several very large and powerful machines for heavy work.

The Carthage Iron Company, of Carthage, Jefferson county, started their charcoal furnace on April 25 with a sufficient supply of charcoal to run an entire year. The furnace produces from 10 to 12 tons of car-wheel pig per day.

Business at the iron works continues to improve. All of Burden's mills on the flats have been running this week, also some of the rivet machines at the upper mills, and there is no prospect of any discontinuance for the present. At the works of Corning & Co. the nail factory has been running steadily now for about a month. The steam mill, water mill, horse-shoe department, steel works and a portion of the Rensselaer works have been in operation all of this week, and there will be no change next week unless the star forge is lighted up and work stopped in the steam mill. No cessation of work in any of the mills is anticipated before the middle of July or the 1st of August. —*Troy Times.*

One of the flumes of the Planters' Hoe Factory at Millville, of which George T. Lane, of Troy, is the principal owner, burst Sunday night, the 12th inst., doing considerable damage. This will necessitate a stoppage of about two weeks, throwing some 30 hands out of employment for that length of time.

The wages of the stove molders in Ransom's foundry, at Albany, have been reduced 40 per cent.

A scissors manufactory is to be started in Ilion.

NEW JERSEY.

Business, which has been suspended at the Agricultural Machine Shops at Raritan during the year past, has again been resumed.

The Rockaway Rolling Mill is running on full time. The Union Foundry at the same place is in full operation.

PENNSYLVANIA.

The Valentine Iron Works at Williamsport have recently commenced operations, and are now making a specialty of small rods for carriage-bolt purposes. They also make blooms for sheet and plate iron. The business was formerly carried on by the Valentine Iron Co., which was wound up some time ago. John N. Lauth is the proprietor, and Heberton & Co., of Philadelphia, the sole agents.

Two large diamond drills have been manufactured at Pottsville for a company in Australia.

On Tuesday, the 7th inst., 940 kegs of 100 lbs. each of Anchor brand nails were manufactured at the works of E. & G. Brooke, Birdsboro. This is the largest number of nails that has ever been made at this factory in one day.

The lower shops at Altoona have received an order for the construction of 1000 box cars.

The Oley Furnace, near Friedensburg, is again in full blast.

A new schedule of wages having been agreed upon, the molders employed at the stove works of Messrs. Orr, Painter & Co., Reading, have resumed work.

The Allentown Rolling Mill Company have received an order for rails, on which they will start up the "big mill," and they have expectations of another order soon. The steel mills have all made contracts as far ahead as they care to, because of anticipations of a rise in price, and companies whose necessities are immediate are compelled to purchase iron rails.

At a meeting of the stockholders of the Cumberland and Elk Lick Coal Company the following persons were elected directors: Hon. H. G. Davis, of West Virginia; Hon. Lloyd Lowndes, Jr., of Cumberland; Alex. Shaw, R. W. Baldwin, C. C. Hicks and John K. Shaw, of Baltimore, and A. C. Chamberlain, of Meyersdale. Maj. Alex. Shaw was re-elected president; A. Chamberlain, vice-president; and C. M. Hoult, secretary.—*Meyersdale Independent.*

The National Locomotive Works, at Connellsville, shipped two locomotives on Saturday afternoon, the 11th instant—the "Pioneer" and "Progress." Both were handsome pieces of mechanism, and were destined for San Francisco, Cal.

We Clip the following from the Sharon *Herald* of the 17th inst.: The Stewart No. 1 went in on Monday the 13th inst. and No. 2 will be cleaned out and got ready for fitting up as soon as it is cold enough. The dimensions of No. 1 are 55 feet in hight from base to tunnel head, 13 feet diameter in the boshes and 7 feet in the crucible, closed front and bell top. The furnace looks very tidy around the bottom, and if the improvement noticed some time ago on the bell and hopper only works as well as is anticipated, the blast will be a trifle longer in point of time. They are still running iron away briskly. At Middlesex the mill went on Friday the 10th inst., working five furnaces, and seems to be doing well; both blast furnaces working off smoothly.

The Hazard Wire Rope Company, Wilkesbarre, recently shipped a wire rope weighing 31,000 lbs., and in one coil, to the Savage Silver Mining Company, Virginia City.

The Reading *Eagle* says Judge Bentley purchased the Crescent Nail Works, Lycoming county, for $20,000.

The County Commissioners of Lebanon county met in the court house on Saturday morning, the 11th instant, and opened proposals for a new iron bridge at Miller's Fording, near Belleview. The contract was awarded to P. L. Weimer, Esq., of the Weimer Machine Works, Reading, for $4135.

The coal trade of this neighborhood is very active, with good prospects for steady work during the summer.—*Sharon Herald.*

It is said that the Glendower Iron Works, at Danville, have enough orders ahead to keep them busy for six months. They are now employing over 100 hands.

The stove works at Limerick Station, Pottstown, are now running four days a week. For some time previous the men had only been making two and three days per week.

The schooner Dora S. Prindall left Allison's Wharf, on the Schuylkill, on Wednesday the 15th inst. for Rio Janerio. She has on board large consignments of goods from Philadelphia merchants and manufacturers. She also had on board nine locomotives from the Baldwin Locomotive Works, with a number of cars intended for railroads running out of the city of Rio Janerio.

The work of rebuilding the abutment of the fallen South street bridge, Philadelphia, has been awarded to the Nolan Bros., of Reading.

PITTSBURGH AND VICINITY.

The bottle furnace at Cunningham & Ihmsen's glass house gave out last week, necessitating the pulling of the bars. As orders are flush, repairs will be made immediately and they will resume in a few weeks.

Campbell, Jones & Co., are shipping glassware to Cuba. Some of the casks are so large as to necessitate the employment of an extra-sized wagon to haul them to the cars.

Messrs. Collins & Wright's Britannia Metal and Tin Works, Pittsburgh, are running a full force of hands until nine o'clock, or 13 hours each day. This firm are arranging to increase their facilities, and have awarded the contract for shafting, pulleys, &c., to Marshall Bros., machinists of this city.

In the Wayne Iron and Steel Works, Brown & Co., No. 5 puddling furnace was changed into a Jarvis gas furnace, and in a

AMERICAN SCREW CO.,

Providence, R. I.

Manufacturers of

IMPROVED

Gimlet Pointed Wood Screws,

Patented

May 30,

1876.

TRADE MARK.

After forty years' experience we offer to the trade our **Centennial Screw,** patented May 30, 1876, as the best we have ever known.

The method of manufacturing is also patented, and we are changing our machinery as fast as possible, to manufacture the **improved** article only. To introduce them, they will be sold at same price as the old style screw.

The new screws will be packed in manila colored **boxes** with new label covering end of box, and **enlarged figures** showing plainly contents.

To distinguish this screw we have adopted a trade mark, which is also secured to us.

The above drawings show the progress of making screw from the old **blunt point** to style now adopted.

Experience has shown that the weak point of screws, as formerly made, is at the heel of the thread, where all the strains of forcing the screw into the wood naturally concentrate.

To avoid the sharp angle existing in the old style of screws has been the aim of all manufacturers, but every expedient hitherto adopted has proved as objectionable as the evil complained of.

It will be seen in our **new screw** that not only is the sharp angle avoided, but the strength very much increased, as illustrated above. See sections at lines.

CLAIM.

"A Pointed Wood Screw having the outer periphery of the thread upon its body cylindrical, while a portion of the body below the thread and near the neck is conical, the remainder of the body to the point being cylindrical, and yet having all the thread brought to an edge of a constant angle, without jogs in the paths between the threads, substantially as described."

B. KREISCHER & SON,
New York Fire Brick &
STATEN ISLAND
CLAY RETORT WORKS,
Established 1845.
Office, foot of Houston Street, East Rever,
NEW YORK.
The largest stock of Fire Brick of all shapes and sizes on hand, and made to order at short notice.
Cupola Brick, for McKenzie Patent, and others. Fire Mortar, Ground Brick, Clay and Sand. Superior Kaolin for Rolling Mills and Foundries. Stone Ware and other Fire Clay and Sand, from my own mines at New Jersey and Staten Island, by the cargo or otherwise.

NEWTON & CO.,
Successor to
PALMER, NEWTON & CO.,
ALBANY, N. Y., Manufacturers
FIRE BRICK
Stove Linings,
Range and Heater Linings
Cylinder Brick, &c., &c,

M. D. Valentine & Bro
Manufacturers of
FIRE BRICK
And Furnace Blocks
DRAIN PIPE & LAND TILE.
Woodbridge, - - - N. J.

A. HALL & SONS, Perth Amboy, N. J.
ESTABLISHED 1846.
HALL & SONS, Buffalo, N. Y.
ESTABLISHED 1866.
FIRE BRICK
of reliable quality for all purposes, manufactured o the best New Jersey Fire Clays. Also, Architectura Terra Cotta, Fire Clay, Fire Sand, Kaolin, Ground Fire Brick and Diamantine Building Brick.

Brooklyn Clay Retort
AND
FIRE BRICK WORKS.
Manufacturers of Clay Retorts, Fire Bricks, Ga House and other Tile, Cupola Brick, &c. Dealers in and Miners of Fire Clay and Fire Sand. Clay bank at Burt's Creek, New Jersey. Manufactory: Van Dyke, Elizabeth, Richards and Partition Sts., Brooklyn, N. Y. Office No. 88 Van Dyke St.

MANHATTAN FIRE BRICK
and Enameled Clay Retort Works.
ADAM WEBER, Proprietor.
Office, 633 E. 15th St., N. Y. Clay Retorts, Enameled for Gas Houses; Retorts for burning raw bone and re-burning bone for Bone Black. Fire Bricks, Fire Blocks, Cupola and Range Bricks of all shapes and sizes. The best fire clay from my own Clay Beds at Perth Amboy, N. J.

Watson Fire Brick Manufactory
ESTABLISHED 1836.
JOHN R. WATSON, Perth Amboy, New Jersey.
Manufacturer of
FIRE BRICK,
For Rolling Mills, Blast Furnaces, Foundries, Gas Works, Lime Kilns, Tanneries, Boiler and Grate Setting, Glass Works, &c.
FIRE CLAYS, FIRE SAND, AND KAOLIN FOR SALE

HENRY MAURER,
Proprietor of the
Excelsior Fire Brick & Clay Retort Works,
Manufacturer of FIRE BRICK, HOLLOW BRICK AND CLAY RETORTS.
WORKS { PERTH AMBOY, NEW JERSEY
Office & Depot: 418 to 422 East 23d St., N. Y

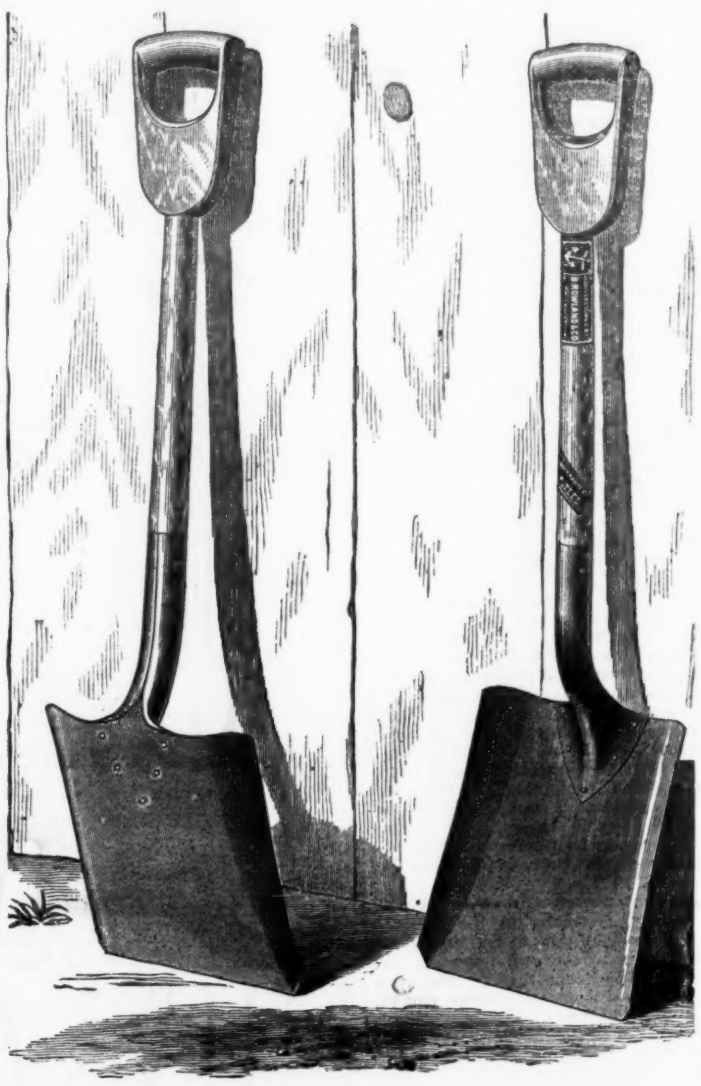
TROY FIRE BRICK WORKS
Troy, N. Y.,
JAMES OSTRANDER & SON,
ESTABLISHED 1848,
Manufacturers of
FIRE BRICK,
Tuyeres, Tiles, Blast Furnace Blocks, etc. Miners and Dealers in Woodbridge Fire Clay and Sand, and Staten Island Kaolin.

Established 1864.
GARDNER BROTHERS,
MANUFACTURERS OF
STANDARD SAVACE
Fire Brick, Tile & Furnace Blocks,
OF ALL SHAPES AND SIZES.
Clay Gas Retorts and Retort Settings,
AND
Miners and Shippers of Fire Clay.
OFFICE: 376 Penn Ave., Pittsburgh, Pa.
WORKS: Mt. Savage Junction, Md., and Lockport, Pa

BORGNER & O'BRIEN,
Manufacturers of
Fire Bricks,
Clay Gas Retorts,
Retort Settings,
Tiles, Blocks, &c., &c.
23d St., below Vine,
PHILADELPHIA.
Eighteen years' practical experience.
CYRUS BORGNER. WM. J. O'BRIEN

CHAS. N. BACON,
Felting & Wadding Manufactory,
Winchester, Mass.
Patent Felt Buffer Wheels for Hardware and Cutlery Manufacturers, Brass Finishers, Nickel Platers, Jewelers, &c. Felt for Boilers and Steam Pipes, Harness Makers, &c. Patent Black Board Eraser.
Office & Salesroom 22 Exchange Place Boston.

B. ROWLAND & CO.,
PHILADELPHIA.



B. Rowland & Co.'s Patent Riveted Shovel.
CAST STEEL.

We would particularly call the attention of the trade to the Patent B. Rowland & Co.'s Anchor Brand Shovel, as now manufactured by us, possessing as it does improvements in construction which render it the most perfect STRAP Shovel made. In it the old style of back strap is entirely dispensed with, and a front strap substituted, riveted and clamped firmly to the blade, clasping the handle in the manner of a ferrule, thus obviating all danger of tearing off strap and making a more beautiful finish front and back. These improvements add to the appearance of the shovel, enhancing its durability at least one-third, and warrant the assertion that all the Shovels we manufacture from this patent will prove the most desirable ever offered the consumer.

The above advantages are also especially noticeable in our Spades and Scoops under the same patent.

B. Rowland & Co.
CAST STEEL.

All goods of this brand (which is copyrighted) are warranted in every respect, and we will guarantee that the following named PATENT RIVETED Shovels and Spades will be made from the gauge of Cast Steel specified:

D Handle Square Point Shovel	13	gauge
D " Round " "	14	"
Long Handle Round Point Shovel	15	"
D Handle Spades	11	
D " Western Coal Shovel	15	"
D " Anthracite Coal Shovel	14	"

Gauged by Stubbs' Gauge.

B. ROWLAND & CO.,
CITY OFFICE,
27 North Fifth Street, Philadelphia, U. S. A.
Works at Frankford, Phila., U. S. A.
NEW YORK WAREHOUSE, 100 Chambers St.

trial recently made 2325 pounds of muck bar with a consumption of only 2205 pounds of fine slack coal, costing about 60 cents.

Some plates were rolled Friday, the 10th inst., at the Millvale Iron Works of Graff, Bennett & Co., that were 56 feet long, 24 inches wide, and ⅜ inch thick. These plates are for the Pittsburgh and Lake Erie Railroad.

A. Bradley & Co., stove makers, are operating their works to their fullest capacity. On the 9th inst. they shipped 300 stoves to Deadwood, Dakota territory, by steamer F. G. Batchelor.

Wm. B. Scaife & Sons shipped to Fernandina, Florida, on the 10th inst., a corrugated iron roof for a railroad depot at that place.

Messrs. Wm. G. Price & Co., have recently made kettles for the Pennsylvania Salt Company that weighs 5000 pounds apiece.

Messrs. Thompson, Epping & Carpenter, of the Keystone Pump Works, are building two large pumps for the Wheeling Iron and Nail Company's Top Mill.

The Union Chain Works of this city are now running full time, and are meeting with a good demand for their chains. They are now making a specialty of extra strong chains for cranes and dredging purposes.

VIRGINIA.

Messrs. Call & Jones, proprietors of the Ferroll Furnace, at Ferroll, Augusta county, lit their furnace up on the 9th inst., put on blast next day, and made No. 1 mill iron that night. They are now making 10 tons of good foundry iron per day.

The Petersburgh Iron Works were recently sold by forced sale at a great sacrifice. One of the principal buildings was bought by Tappey & Steel, founders and machinists of that city, for $5000. These works at one time ranked second only to the Tredegar Works in the State of Virginia.

The fine machine shops of Jalbott & Sons, of Richmond, have been enriched by about $10,000 worth of the most improved tools by the best makers in Philadelphia and Massachusetts, embracing shafting, lathe, radical drill, planers, &c. This establishment enjoys a first-class reputation for its manufactures.

Messrs. H. M. Smith & Co., agricultural implement manufacturers of Richmond, have been very busy since January last. Although working a force of 75 hands, the full capacity of their workshop, they have been compelled to buy of other manufacturers for the supply of their orders as much work as they have made themselves.

WEST VIRGINIA.

At last accounts of the seven nail works and two sheet-iron mills in Wheeling, only one nail factory and one sheet iron mill were idle. These were shut down because of repairs, and they have probably started again before this. Wheeling is one of the largest nail manufacturing cities in the country. The various nail mills give employment to about 3800 men, and have at present some 700 machines working, with a weekly capacity of about 40,000 kegs of nails.—*Cleveland Trade Review.*

OHIO.

B. F. Mercer, Alliance, manufacturer of improved well and cistern pumps and porcelain and iron cylinder pumps, is rapidly and surely extending his trade. He expects to make 5,000 pumps this year.

The Peerless Oil Stove Company, Cleveland, expect to manufacture 3,000 stoves this season. They have recently made large shipments to Toledo, Dubuque, San Francisco, Akron and other places.

Thomas R. Butman & Co., Dayton, are erecting for the Evangelical Association of Cleveland two furnaces and one patent slow combustion hot blast with Butman's patent grate and door complete.

Akron *Beacon:* Twelve self-binders is the Buckeye's daily run at present.

The Akron Knife Works are now running 14 hours a day.

The Excelsior Works are shipping from 40 to 75 machines a week. The works are running to their fullest capacity, yet they are unable to keep up with the orders.—*Doylestown Journal.*

The Cleveland Steam Gauge Company have leased and will occupy at an early date the premises on West street formerly occupied by Thomas Manning & Sons as a machine shop and foundry.

The B. and O. Company recently discharged 27 employees from their shops at Newark.

The Monitor furnace went into blast on Monday, the 13th inst.

Russell's agricultural implement manufacturing establishment at Massillon was destroyed by fire on Friday night last, The loss is estimated at $90,000, only a portion of which is covered by insurance.

Arms, Bell & Co. are working into quite a business building bridges. They get their contracts from Wm. O. Douglass, of Binghamton, N. Y., Mr. Douglass being the patentee. Arms, Bell & Co. get all the contracts taken for bridges west of Binghamton. They have just completed two bridges that were yesterday shipped to Kentucky, and this week they began building another bridge 100 feet span that is destined for some place in the West. Their works are now running full tilt in all departments. This, together with all of Brown, Bonnell & Co.'s works running full tilt day and night, makes things look lively in that corner of the city.—*Register and Tribune.*

The Washington Furnace, when remodeled, will be 50 feet high, with 11 feet bosh; hearth, 6 feet. She will probably be blown through two tuyeres. as there are but two tuyere arches. though it is possible they may find it advantageous to introduce two blowpipes in each arch. It is expected the furnace will be in operation before July 1. Capacity rated at 18 to 20 tons in 24 hours.

Lawrence Mill, Ironton, is on full.

The Monday Creek Furnace, which has been in blast for the past two weeks, has been making about 20 tons of No. 1 foundry iron and is running splendidly. This company are largely composed of citizens at the furnace, who are much elated over the success. Much credit is due Mr. F. B. Baird for the quick and substantial manner in which he has rushed the building of this furnace to completion. It was commenced late last fall, and went into blast much sooner than was expected by any one except Mr. Baird.—*Logan Republican.*

The Variety Iron Works, Cleveland, have finished, under late patents of a Cleveland inventor, a new machine for cutting match woods and wood toothpicks. The machine is said to work perfectly, and to cut 6000 toothpicks or woods per minute.

The Hubbard Rolling Mill is running full time, with plenty of orders ahead.

H. L. Shepherd & Co., manufacturers of the Shepherd lathe at Cincinnati, are running their works full, turning out from 15 to 20 lathes per week and shipping about as fast as they are finished. They have recently shipped one to New Zealand, four to London, England, one to Kansas, one to Eutaw, one to South Meriden, Conn., and one to Cherry Valley, N. Y. They are expecting several orders from Europe for lathes of different sizes.

The Sellew Mfg. Co., of Cincinnati, manufacturers of plain, stamped, retinned and Japanned tin, zinc and sheet iron ware, are now in operation with a moderate force. This is a new company, of which Mr. R. H. Sellew is president and treasurer, Mr. C. H. Townley, secretary, and Mr. D. D. Martin, vice-president and superintendent. They are turning out some very fine ware and stocking up in anticipation of a fair summer and fall trade.

WISCONSIN.

At the Merrill & Houston Iron Works, Beloit, 150 men are industriously engaged upon machinery for a new paper mill at Appleton.

ILLINOIS.

The Wier Plow Co., at Monmouth one of the most extensive establishments in the northern portion of the state, are driven to their full capacity, and will largely increase their product over last year. They are now working a force of about 425 hands, with a monthly pay roll of $19,000. The present daily product of the works is 200 cultivators, 100 walking plows, 40 sulky plows,—about 400 plows of all kinds; 30 seeders, and 30 vibrating harrows and a large number of sulky hay rakes. The daily consumption of material during this busy season amounts in value to $5000. The works are kept running the year around, though during about six month only a half force is employed.

The Novelty Works of G. D. Colton & Co., at Galesburg is running with a force of 40 hands, doing a general foundry business, and manufacturing their patent improved power punch and shears, and some other specialties. This is the pioneer foundry and machine shop of Knox county, having been established by the present proprietors as long ago as 1837, since which time they have been run continuously. The Colton patent improved power punch and shears is a machine especially adapted to the foundry, machine shop and factory, and is the result of over thirty years experience in the business.

The Princeton Manufacturing Company, the leading industrial establishment of that town, is driven to its utmost capacity, working a force of about 40 hands. They will turn out this season at least 400 sulky plows, 300 walking plows, 2000 Princeton cultivators, riding and walking; 200 corn stalk cutters, besides a large number of spring bed bottoms and other smaller articles that are included in their products.

The Sandwich Manufacturing Company are busy on full time, with a force of over 200 hands, filling up the season's complement of harvesters and cultivators. They will turn out this year at least 1500 of the famous Adams & French harvesters, about one-half of which will be supplied with their model automatic binding attachment. They will also make this season 2000 cultivators, together with a large number of the Adams patent self-feeding corn-shellers, ranging in capacity from 600 to 3000 bushels of corn per day, according to size. Another of the specialties of this enterprising company is machine keys.

The Mathiessen & Hegeler Zinc Company, of La Salle, recently completed their new zinc rolling mill and are turning out from 27 to 30 tons of sheet zinc daily.

The Union Car Spring Company, Chicago, report the sale of over 70 tons of their springs in the month of April, which is more than for any other month before in Chicago.

KENTUCKY.

The Ducktown Copper Smelting and Refining Works, at Ducktown, Polk county, have eight furnaces in blast, two reverberating furnaces, two calciners and one refinery, the latter having capacity to turn out 200,000 pounds per month of refined copper.

Thos. Meikle & Co., Louisville, have been kept busy lately in filling orders from all parts of the country for Meikle's iron and wood beam double-shovel plows. These plows have Meikle's patent adjustable clevis and cast-iron flanged brace, which adds very much to their working quality and strength.

The Louisville Chain Works has just made a chain cable 320 feet long, of 1⅛ inch iron, for the new steamer J. M. White, now being finished at the Portland wharf.

J. G. Kirker, of Louisville, manufacturer of mill machinery, is busily engaged in shipping it to Cloverport.

MICHIGAN.

The Carp River, Pioneer and Fayette furnaces are the only ones in the Lake Superior region that are now in blast. All the others have been idle for some time and are likely to remain so for an indefinite period.

The stove department of the old agricultural works at Wyandotte has resumed work for a week or so. Castings for a lot of unfinished stoves are being made. About 20 men are at work.

A monument in fine art metal work has just been erected in St. John's Church, Princess Street, Edinburgh, to the memory of Dean Ramsay. The monument, which is of bronze, silvered and gilt, consists of a projecting canopy, surrounded by a series of enameled plaques, representing the thistle and the rose, and alternating with clusters of amethysts and crystals. The crest is of silvered foliage and enameled daisies; while the canopy is surmounted by a cross, enriched with amethysts and crystals, supported by shafts bound with traceried fillets, and the base consists of an inscription tablet, with a border of enameled forget-me-nots, onyx stones, and pebbles.

The Founding of Alloys.*

BY EDWARD KIRK.

VI.

(Concluded.)

COPPER.

Copper is a reddish metal; its fusing point is 1994° of Fahrenheit's scale. It is ductile and malleable, and is an excellent conductor of heat and electricity. It exhales a peculiar smell when warmed or rubbed; it melts at a bright-red or dull white heat.

Copper is found native in large quantities in regular veins, near Lake Superior, and frequently in masses of great size. The heavy masses of copper in these places are imbedded in volcanic rock, and small veins ramify it in all directions. It occurs in bodies of almost every size, from small grains to masses weighing 10 tons and upward. This native copper is frequently found to be mixed with silver in distinct fiber, the latter not being alloyed with the copper. In these mines stone hammers have been discovered, the tools of a people older than the Indians, who probably occupied this continent and worked these mines. In the Western mounds, also, copper instruments are found, and it is thought that the mound-builders of the Western and Southwestern States worked these mines. Native copper is found in almost every vein of copper ore. It has been found in those of New Jersey, and also in those of Pennsylvania and some of the Western territories. Copper ores are, like iron ores, very abundant, and there is a great variety of them. They are found in almost every State in the Union. Copper ores are smelted on the same principle as iron ores—by heating with carbon.

The ores from which copper is principally smelted are the sulphuret ores, the copper pyrites, the red and black oxides, the carbonates of copper and others. The sulphuret ores are the ones from which the most copper is smelted. There are two kinds of these ores: one is called the gray sulphuret of copper, the other copper pyrites. The pyrites generally contain more or less iron, and it resembles iron pyrites very much, but may be easily distinguished from it by its lively rain-bow colors. The iron pyrites are always found with the copper pyrites, and the best ores contain from 10 to 20 per cent. of iron and 40 or 50 per cent. of copper, while some of the poorer ores only yield 3 or 4 per cent. of copper. These pyrites ores are found in most all the metamorphic rocks of the United States, particularly around the lakes, all along the Atlantic coast, and through the Rocky Mountains. The copper pyrites are very abundant, but are frequently so mixed with other matter as to make the mining and smelting of them unprofitable. They are commonly associated with iron. In New York, New Jersey and Eastern Pennsylvania they are mixed with magnetic iron, and in Vermont and North Carolina with the sparry carbonates of iron, and with iron pyrites everywhere. The copper pyrites generally accompanies the gold-bearing iron pyrites in all cases, and is considered a good indication of richness. Copper is also found with sparry iron, galena and sulphuret of zinc. But there is very few instances in which any of these ores will pay for working, as they rarely yield more than 4 or 5 per cent. of copper.

The gray sulphuret of copper is a compact ore. Its surface is a dull lead-color or an iron-gray. It is also found of a faint red-color when taken near the surface of the ground. It is very easily smelted, and yields a large percentage of copper when the ore is pure. This ore is found in heavy veins in the copper regions of Lake Superior, and also in New Jersey.

The red oxide and black oxide ores of copper are not very plenty, and are little used for the production of metallic copper.

The carbonate of copper is generally of a blue color, but it is also found of all shades, from dark-blue to light green.

The phosphates and chlorides of copper are both of a green color and form no regular copper ores.

There are several other copper ores, but those described are the principal ores from which our supply of copper is obtained. There is scarcely any of the copper ore which does not betray the presence of that metal by a green film.

Copper is extensively used with other metals in forming alloys of brass, britannia, bronze, German silver, hard solder, &c. It is also used alone for many purposes, such as sheathing and bolts for ships, brewing, distilling and culinary vessels, rolls for calico printing, paper-making, plates for the use of engravers, &c.

ZINC.

Zinc is a bluish-white metal, with considerable luster, and rather hard. It melts at about 773° of Fahrenheit's scale. It is ordinarily brittle, but when heated to a little above 200°, and between that and 300° it becomes ductile and malleable, and can be rolled out into the sheet-zinc in common use, or be drawn into moderately fine wire, which, however, possesses but little tenacity.

Zinc, when melted, burns in the air with a magnificent green light, forming flakes of zinc-oxide, sometimes called "Philosopher's Wool." When exposed to the air zinc soon oxidizes, and the thin films of white oxide, formed over the surface, protects it from further change.

Native zinc or spelter, as it is called in commerce, is never found; it has so much affinity for other matter, particularly oxygen, that it cannot exist very long in its pure state. The principal ores of zinc are zinc-blende, red zinc ore and calamine ore. The zinc-blende is a sulphuret of zinc, and is composed of 60 or 70 per cent. of zinc, and the balance sulphur; its color is generally a bright or yellowish-brown, but it is occasionally found of a black, red, green or yellow color. This ore is always found crystalized, and in most cases the masses of it are mere accumulations of crystals. It is transparent or, at least, admits of the passage of light if in thin scales. This ore is found in heavy veins and masses in the gold regions of the Western Territories and Southern States. It sometimes contains silver and also gold in considerable quantities. It is sometimes associated with galena iron and copper pyrites, tin, heavy spar, black manganese and manganese spar. This ore is chiefly worked for its gold and silver, all the zinc being lost by being either converted into cinder or washed away. The red zinc ore is the principal source from which we obtain our supply of zinc or spelter. This ore is extensively deposited in New Jersey and Pennsylvania, and is used for the manufacture of zinc or spelter. There is a very large zinc works at Bethlehem, Pa., and several large works in New Jersey. The red zinc ore is a compound of oxide of zinc, manganese and oxide of iron; its color is a brick-red with a yellowish tinge, like cinnabar. The calamine ore is a silicate of zinc; it is a dirty-yellow or stone color; if pure it consists of about one-half oxide of zinc; the other half is composed of carbonic acid, silex, iron and other admixtures. This ore is very plenty, and is found in heavy beds in Eastern Pennsylvania; it is found in heavy veins, and may be looked for in all the limestone rock from the most recent to the oldest formations.

Zinc is used in its pure state for sheet zinc and for coating sheet iron, gas pipe, &c., with. To form galvanized iron—this is made by dipping the iron into a bath of molten zinc, and the iron comes out coated with zinc. Sheet zinc is sometimes used for roofing buildings, but it should not be used for foundry roofs, as the steam from the sand corrodes it, and will soon eat it full of holes. Zinc is also extensively used with other metals in forming alloys of brass, German silver, hard solder, &c.

TIN.

Tin is a silvery-white colored metal, with a slight tint of yellow. Its fusing point is 422° of Fahrenheit's scale. It is soft and not very ductile, but is quite malleable, so that tin foil, which is obtained by beating out the metal, is not more than one-thousandth of an inch in thickness. When quickly bent it utters a shrill sound called the tin-cry, which is caused by the destruction of cohesion and the crystals moving upon each other. When a bar of tin is rapidly bent backward and forward several times successively, it becomes so hot that it cannot be held in the hand. When rubbed it exhales a peculiar odor. Tin does not oxidize rapidly at an ordinary temperature. Its tendency to crystallize is remarkable.

Tin, though one of the metals longest known to man, is found in but few localities. There are but two ores of tin known which are of any practical use. One of these is tin-stone or peroxide of tin. The other is sulphuret of tin, or tin pyrites. No tin is manufactured in the United States at present, although tin-stone is found in the New England States, and is said to have been discovered in Missouri. This, however, is doubtful. Tin-stone occurs chiefly in granite in heavy masses or lodes mixed with conglomerates of various rocks. It is also found in alluvial gravel as the result of the decomposition of the above rock, and is then called stream tin. Tin-stone is of a variety of colors, white, gray, yellow, red, brown and black. Its most striking feature is its weight. Tin pyrites are not very abundant and cannot be considered an ore of tin. Their presence in the silver ores of the Southern gold region is so limited as to render the extraction of the metal unprofitable. This ore is of a gray or yellowish color, heavy, crystallized and of a metallic luster.

Tin is extensively used with other metals in forming alloys of pewter, brittania, brass, bell metal, soft solder, fusible metals, &c. Pure tin is commonly used for dyers' kettles. It is also sometimes employed for the bearings of locomotives, carriages and other machinery. Common sheet tin is formed by dipping sheet iron in a bath of melted tin covered with oil, or with a mixture of oil and common resin. They come out thoroughly coated with tin. Tinned iron wire is similarly prepared. Cast-iron hollow-ware is tinned by heating the ware to redness and putting molten tin into the pot or kettle intended to be tinned and spreading it over the surface with a piece of cork. Sal-ammoniac or resin may be used as a flux. Pins made of brass wire are boiled with granulated tin, cream of tartar and water, which gives a bright white surface to the pins. Mirrors are silvered with an amalgam of tin and mercury. The process is as follows: Tin-foil is first spread evenly upon a marble table, and then the mercury is carefully poured over it. The two metals combine, forming a bright amalgam. A clean, dry plate of glass is then carefully pushed forward over the amalgam, so as to carry the superfluous mercury before it, and also prevent the air from getting between the glass and the amalgam. Weights are then placed on the glass to cause the film to adhere more closely, and in 24 hours the glass is removed and in three or four weeks is dry enough to be framed. This process of making mirrors is very injurious to health, and the workmen are short-lived. A paralysis sometimes attacks them within a few weeks after they enter the manufactory, and it is seldom that a man escapes for more than a year or two. The effects are similar to that of calomel. The men seem to dance instead of walk, and they cannot steady their nerves nor direct the motion of their hands; and in some cases they cannot digest their food.

LEAD.

Lead is a bluish-white metal; its fusing point is 620° of Fahrenheit's scale. It is remarkably flexible and soft, and will leave a black mark on paper. It is poisonous, though not immediately, as bullets have been swallowed and then thrown off without any harm, except fright; its effects seem to accumulate in the system, and finally to manifest themselves in some disease. The sugar of-lead has a sweet, pleasant taste, but is a virulent poison; its antidote is Epsom salts

Lead appears to have been known in the earliest ages of the world. The most common ore of lead is galena or sulphuret of lead; this ore has the luster and color of polished metallic lead. It is always gray, without a shade of any other color, but its powder, when finely rubbed, is black. It is always found in a crystalline form, the crystals being cubes, often composed of square plates, and frequently so small as only to be detected by the aid of a glass; in other instances the cubes or the plate which forms the cubes are more than one inch square. Galena is very heavy, and equal to metallic iron in specific gravity; it is the heaviest of all metallic ores. Galena is very extensively distributed over the United States, and is found in almost every State in the Union; the most extensive deposits are in the Western States. It is extensively worked on the upper Mississippi and in Missouri. Galena, containing silver, is very extensively distributed over the whole gold region, but it is not generally in use. The difficulty of smelting this ore profitably appears to be in the way of its more general application. Lead is also obtained from the carbonate of lead, an ore of frequent occurrence, but it rarely forms a vein of itself. The phosphate of lead is also an ore from which metallic lead is obtained. Lead is reduced from its ores by roasting in a reverberatory furnace; the sulphur burns and leaves the metal.

Lead is used in its pure state for pipe, bullets, sheet-lead, roofs, vessels for sulphuric acid, &c.; it is also used, with other metals, in forming alloys of pewter, type metal, soft solder, fusible metals, &c. Ships were sheathed with lead and wood from before the Christian era to 1450, after which wood was more commonly employed; and in 1790 to 1800 copper sheathing became general.

NICKEL.

Nickel is a white, brilliant metal; it fuses at 2732° of Fahrenheit's scale; it is ductile and malleable, acts upon the magnetic needle and is itself capable of becoming a magnet. Its magnetism is more feeble than that of iron, and vanishes at a heat somewhat below redness. It does not oxidize by exposure to air at common temperatures, but when heated in the air it acquires various tints, like steel; at a red heat it becomes coated by a gray oxide.

There is very little nickel ore found in the United States, and the only mines that are worked at the present time in this country are located in Eastern Pennsylvania; and from these mines the United States government receive their supply of this metal for making the five-cent nickel coin now in use. This metal is scarcely used in its pure state, but is principally used together with copper, zinc and other metals in forming alloys, and these alloys are rendered the harder and whiter the more nickel they contain. The white copper of the Chinese, which is the same as our German silver, is composed of 3 parts nickel, 5 parts copper and 2 parts zinc; this alloy sometimes contains a little iron, and a small amount of that metal seems to improve the alloy. This metal is also extensively used for plating other metals, and for this purpose it is rapidly taking the place of silver. When plated on other metals it has a silvery whiteness and receives a high polish, which lasts for years, and its hardness is almost equal to that of steel, which eminently fits it for the plating of mathematical and other delicate instruments.

ANTIMONY.

Antimony is of a silvery-white color, with beautiful laminated star-like crystalline structure, and is very brittle. Its fusing point is about 800° of Fahrenheit's scale, or at a dull red heat, and it is volatile at a white heat. Antimony is commonly found in the form of a sulphuret, which is very volatile, easily fused and requires great caution in roasting. The sulphur cannot be entirely separated by roasting, and this causes the roasted matter to have a dark-gray color. A mixture of sulphuret and protoxide, the more perfectly the desulphuration of the ore is performed the more will the color approach to a faint yellow. Impure lead ore has this characteristic in common with antimony, but before roasting it is not difficult to decide between antimony and lead.

Antimony was discovered by Basile Valentine, a monk of Germany, in the fifteenth century. It is said that to test its properties he first fed it to the swine kept at the convent, and found that they thrived upon it. He then tried it upon his fellow monks, but perceiving that they died in consequence, he forthwith named the new metal, in honor of this fact, anti moine (anti-monk), whence our term antimony is derived.

Antimony expands on cooling. It is scarcely ever used alone, but is generally used with lead, tin and other metals in forming alloys. Antimony and tin mixed in equal proportions form a moderately hard, brittle and very brilliant alloy, capable of receiving an exquisite polish and not easily tarnished by exposure to the air. It has been manufactured into speculums for telescopes.

BISMUTH.

Bismuth is a brittle, reddish-white metal. It fuses at 507° of Fahrenheit's scale; always crystallizes on cooling; is volatile at a high heat; transmits heat more slowly than most other metals, perhaps in consequence of its texture. This metal is seldom used alone for any useful purpose, but is employed for imparting fusibility to alloys of other metals. An alloy of 3 parts lead, 2 parts tin and 5 parts bismuth may be melted in boiling water or at a heat of 199° Fahrenheit, yet when these metals are melted separately, tin requires a heat of 442°, lead 620° and bismuth 507°.

ALUMINUM.

Aluminum is a bright silver-white metal; it is only one-fourth as heavy as silver; it is ductile, malleable and tenacious; it receives its name from alum in which it occurs: it is also called the clay metal.

Aluminum is found in slate-mica clay and in all the clay rocks, and from these substances we obtain our entire supply. This metal is but very little used at present in the useful arts, but it must ultimately come into common use, for, next to oxygen and silicon, it is the most abundant element of the earth; every clay-bank is a mine of it, but the metal is very difficult to obtain, and can only be obtained by the galvanic process.

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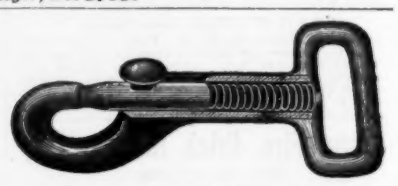
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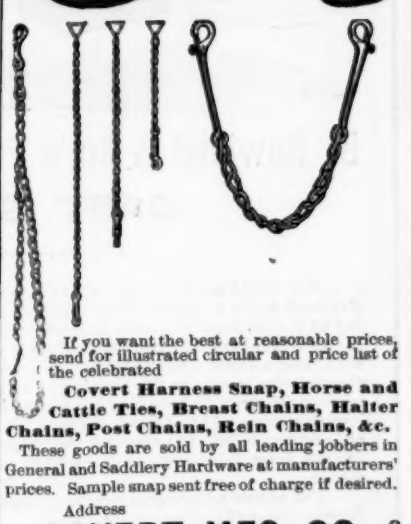

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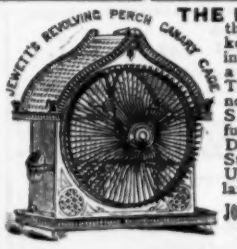

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For June.

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CONTENTS.

Vol. II. JUNE, 1878. No. 4.

COPPER DRESSING IN LAKE SUPERIOR—II.—
T. Egleston, Ph. D.
STUDIES IN SHEFFIELD—II.—HOMOGENEITY AND ANNEALING.—
W. Mattieu Williams, F C. S., F. R. A. S.
QUICKSILVER PRODUCTION AT IDRIA.
DETERMINATION OF TOTAL CARBON IN IRON AND STEEL.— Andrew A. Blair.
COMPRESSED BESSEMER STEEL.
THE TERRENOIRE PROCESS OF MAKING SOLID STEEL CASTINGS—II.— Alex. L. Holley.
JAPANESE COPPER CASTINGS.
THE MECHANICAL DRESSING OF ORES AND COAL—IV.— E. F. Althans.
COPPER EXTRACTION FROM POOR ORES AT OKER (LOWER HARTZ).
SIEMENS-MARTIN FURNACE.
A NEW STEEL CASTING APPARATUS.
NOTES ON THE METALLURGY OF NICKEL.
ON THE MANUFACTURE OF COKE FROM ANTHRACITE DUST.— Jones Wister.
COMPOSITION OF MINNESOTA AND PASCHKOFF COPPER.— Dr. W. Hampe
SEPARATION OF ANTIMONY AND ARSENIC.
DELICATE TEST FOR VAPORS OF MERCURY.

The June number of the *Metallurgical Review* contains a large number of articles by engineers and scientists pre-eminent in their specialties, and therefore the information, the suggestions and the criticisms on topics of far-reaching importance, will command the attention of practical metallurgists and prove of direct benefit to them.

The second part of "Copper Dressing in Lake Superior," by Prof. Egleston, gives the most detailed, accurate and discriminating description of the well-known Ball Stamp, with careful data as to the duration of its various parts, their weight and a summary of their cost. The work performed by the stamp at various mills is tabulated, thus permitting a very accurate estimation to be made of the amount of work it is able to perform. Among the illustrations are drawings of the details of the mortar which have until now been strictly withheld from the public.

The subject of Prof. W. Mattieu Williams' second contribution to the series, "Studies in Sheffield," is "Homogeneity and Annealing." The author, who is so thoroughly conversant with the important topics now agitating both engineers and metallurgists, makes some suggestions as to the means by which the great desideratum, a metal which shall combine the toughness of iron with the homogeneity of steel, may be attained.

Mr. Andrew A. Blair, chemist to the United States Board appointed to test Iron and Steel, gives a description of a method and an apparatus used by him in the "Determination of the Total Carbon in Iron and Steel." Both the method and the apparatus are the result of careful investigation, the methods used hitherto being found incapable of meeting the requirements of the Board—extreme accuracy, reasonable speed and no undue difficulty of manipulation. Chemists who are frequently called upon to make the determination of total carbon in iron and steel, will find the apparatus eminently adapted to the purpose, to which should be added that it possesses the advantage of being cheap.

The second installment of Mr. Alex. L. Holley's paper on the "Terrenoire Process of Making Solid Steel Castings," gives numerous illustrations of the practice taken from actual working charges made at Terrenoire, the exact amounts charged and time required, the nature of the tests being accurately detailed. The fact that the process has been introduced with conspicuous success in an American crucible works, proves the great importance of the subject to steel makers in this country.

Little attention has been given by American mining engineers to the intricate problems connected with the stamp mills. Some valuable information on the subject will be found in this month's installment of Mr. E. F. Althan's paper on the "Mechanical Dressing of Ores and Coal."

Copper extraction from poor ores by chlorination has been for many years one of the great industries connected with England's enormous alkali trade, poor cupriferous pyrites being roasted for the manufacture of sulphuric acid and then leached for copper. Although the process has been repeatedly described, its chemical features have never before been so clearly brought before the public as in the article now presented.

The abstract of M. Badoureau's excellent summary on the "Metallurgy of Nickel" is brought to a close in this number. Short notes on the "Manufacture of Coke from Anthracite Dust," by Jones Wister, and on the "Composition of Minnesota and Paschkoff Copper," by Dr. W. Hampe, add to our knowledge of subjects which well merit attention. Dr. Hampe's complete analysis of Minnesota copper is the first of its kind on record, proving by analysis what users of copper have long ago ascertained, that there is no copper in the market capable of rivaling the Lake Superior brands.

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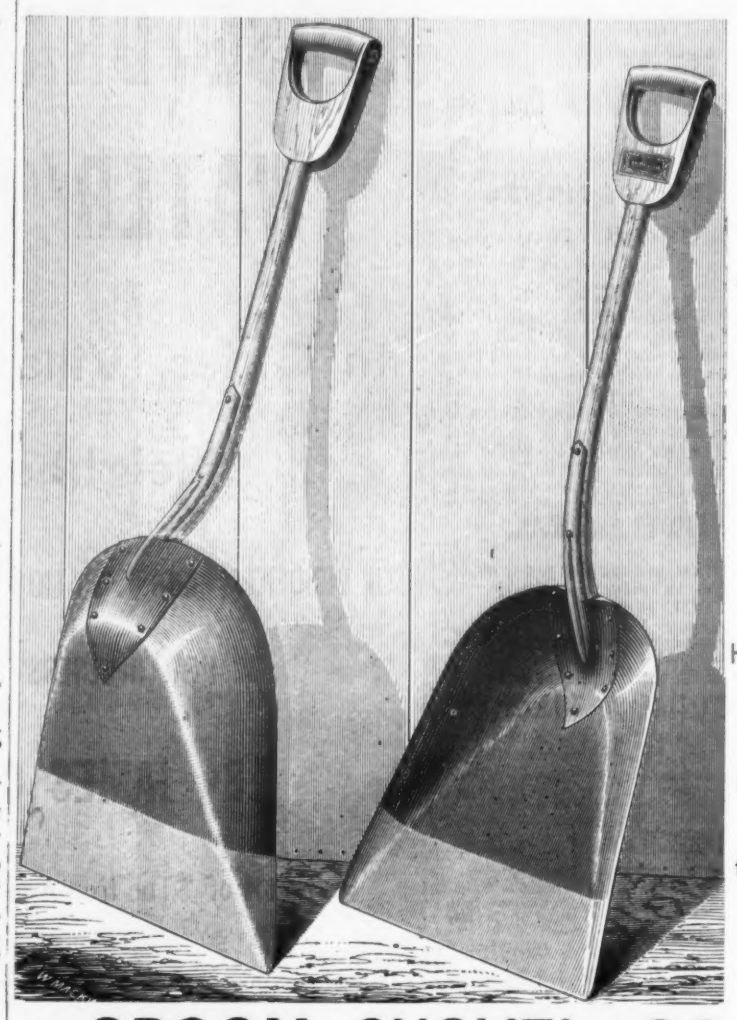

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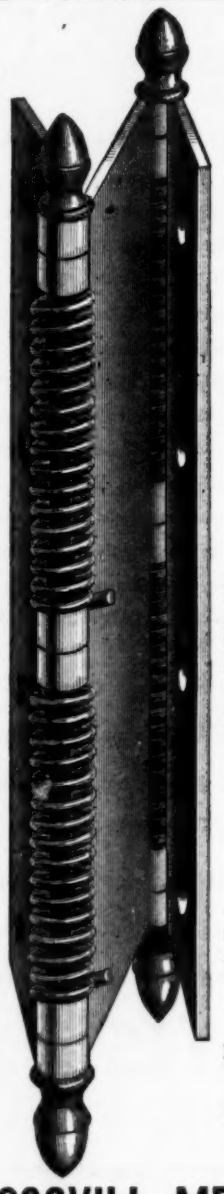

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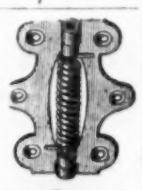

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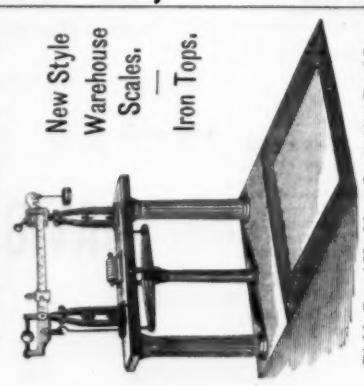

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Empirical Formula for Strength of Wrought Iron Beams, Channels, &c.

BY PERCIVAL ROBERTS, JR.*

The following formula is entirely empirical, and it is only because it has been found to give very good results in practice and to be very convenient for rough calculations that I venture to bring it to the attion of the club:

$$\tfrac{1}{3}\left(\frac{\text{Area in sq. in.} \times \text{depth of bar in inches} \times 4}{\text{length of span in feet.}}\right) = \text{L}$$

L is the safe load in net tons uniformly distributed upon a laterally supported beam. If the load be upon the middle of the beam this result must be divided by 2; if it is upon any other point, the safe load at the center is to that at any other point as the rectangle of the segments at the point is to the square of half the span. In the calculated tables for I beams published by the Trenton and Phœnix Iron companies, different results are arrived at, although both take 12,000 lbs. per square inch of section, the reason being that there are some slight differences in the formulæ employed in the calculations. It is proper to remark that the weight of the beam must be deducted from the results obtained by all the formulæ used. The area of the bar is found by dividing the weight per yard by 10.

Below are given the calculated safe loads for Trenton and Phœnix beams by both their own formulæ and the above empirical formula.

PHŒNIX BEAMS, FOR TEN FEET SPAN.

Size. Feet.	Weight per yard. Pounds.	Phœnix safe load. Net tons.	Empirical safe load. Net tons.
15	200	41.00	40.00
15	150	30.20	30.00
12	170	29.20	27.20
12	125	20.80	20.00
10½	105	15.50	14.70
9	150	19.70	18.00
9	84	10.80	10.08
9	70	9.20	8.40
8	65	7.40	6.93
7	55	5.40	5.13
6	40	3.50	3.20
5	36	2.50	2.40
5	30	2.10	2.00
4	30	1.80	1.60

TRENTON BEAMS, FOR TEN FEET SPAN.

Size. Feet.	Weight per yard. Pounds.	Trenton safe load Net tons.	Calculated safe load. Net tons. Empirical.
15⅜	200	37.40	40.30
15 1/16	150	27.55	30.37
12 1/16	170	25.55	27.90
12¼	125	18.85	20.41
10½	135	18.00	18.90
10⅜	105	14.30	14.70
9	125	13.40	15.00
9	85	9.45	10.20
9	70	7.60	8.40
8	80	8.40	8.50
8	65	6.75	6.90
7	60	5.05	5.60
6	50	3.80	4.00
6	40	3.13	3.26
5	40	2.45	2.66
5	30	1.90	2.00
4	37	1.80	1.97
4	30	1.50	1.60

These figures show that the Phœnix Company give from .30 of a ton to more than 2 tons more weight for load upon same section of beam than is obtained by using the empirical formula, and that the Trenton Company give about as much less. The empirical formula holds a very fair mean between the two throughout, and would seem to be quite reliable.

Albert Borsig, the German Locomotive Builder.

Germany has lost one of her most famous sons, Berlin one of its wealthiest and most eminent citizens. Albert Borsig, the chief of a firm of world-wide renown, the owner of the extensive Borsig Works, died on the 10th inst., at the age of only 49 years, from heart disease. The Borsig factories are second only to those of Alfred Krupp; indeed, it may be said that Krupp and Borsig are the representatives of the German iron industry, the former devoting all his energies to the destructive weapons of war, the latter to works of peace. The Borsig locomotive engines are just as well known in Germany and many other continental countries as are Krupp's cannons. Albert Borsig, the only son of John Borsig, inherited the wealth and factories of his father in July, 1857. John Borsig was a self-made man. When he established his business in 1837 he employed only fifty workingmen; now no less than seven thousand families are living on the Borsig premises in Berlin and Silesia. Perhaps Albert Borsig could not have started a business and acquired a fortune as did his father, who was a most ingenious inventor and practiced engineer. But Albert Borsig could keep the fortune he inherited, and work out the plans of his father. He extended the establishment at Berlin, which has built nearly 4000 locomotive engines, besides a great many steam engines for ships, factories, &c. When rents increased in Berlin to an enormous hight, Borsig acquired mines in Silesia, and there established a workingmen's colony. Borsig's Silesian mines supply the coal and pig iron used in the Borsig establishments in Berlin and Moabit—a Berlin suburb. In spite of his enormous wealth Albert Borsig had frugal habits. A patent of nobility was repeatedly offered him; he refused it. A decoration, however, he accepted as an acknowledgment of his and his workingmen's labors. Although devoted to his extensive business he still found time to cultivate a taste for fine arts. His gardens and hot-houses are one of the Berlin sights which no visitor will care to miss, and his palace—which, however, he was not destined to inhabit—is a most wonderful building. The influence of Borsig was also felt in the financial world. He was a member of the committee of the Imperial Bank, and invested enormous sums on the Stock Exchange in discounting bills. His wealth cannot be estimated in pounds and shillings. Twenty to thirty million marks could scarcely pay his extensive works, his workingmen's city and stock. Although rather severe toward those he employed, he will be greatly deplored by the workingmen, for he understood his business thoroughly, and never neglected the duties of a master. He leaves some children who are not yet of age; but the business will be carried on as hitherto.

* Read before the Engineers' Club of Philadelphia.

Secretary Evarts on the Export Trade.

Secretary Evarts, in his letter transmitting to Congress the Annual Report on Commercial Relations of the United States during the year 1877, gives an abstract of the trade and commerce of various nations, and says:

As more than three-fourths of the export from the United States is composed of breadstuffs and raw materials necessary to the manufacturers of Europe—exports which cannot be duplicated by any other country—it may be assumed that our actual export trade is assured at its present proportions. It may be further safely assumed that it must go on increasing with the increasing consumptive powers of Europe, and our own increasing agricultural capacity and carrying facilities. Any exportation of manufactures—and a few years hence must behold us successfully competing with the great manufacturing countries of Europe in the markets of the commercial world—will be so much added to our present export trade. While our export trade has gone on and will go on increasing, our facilities to supply our wants have also gone on and will continue increasing in like manner. The decrease in our imports of manufactures from Europe has almost reached its extremest limit. Henceforth we shall be felt in the commercial world not only by the inexhaustible exports of our natural products, but also by the products of the mechanical ingenuity and genius of our people, directed by practical education, adaptability to circumstances, and indomitable energy. Thus when the overworked manufacturing and producing countries of Europe, kept to their utmost tension by forced sale, low wages and ceaseless assiduity, show signs of exhustion, the United States, in the very fullness of her vigor and capacity, exhaustless in material and mechanical skill, comes to the front to honorably compete with the older nations for the world's trade. There are but a few possibilities which can retard this programme. So keen is the competition in all branches of trade throughout the world that even a three months' halt or disorganization of any special manufacture, by strikes or violence of any kind, is sure to displace that certain manufacture, seemingly for the time being, on the markets. This leaves a vacancy which is immediately taken advantage of by the manufacturers of other countries. The disorganized mass is pushed aside, so to speak, and the well-regulated and organized competitors fill up the place in industry which was forfeited by misunderstanding or strikes. The country which can count on regular continuity of labor, a thorough identity of the interests of capital and labor, is capable of achieving more lasting results than countries of greater wealth and capacity, but of more uncertain labor. The principal cause of the decline in the manufactures of leading commercial nations is the continued trade union strikes and the disorganization created thereby. Nothing so full of serious consequences to the manufactures of a country—consequences which may seem at first only to affect capital, but which ultimately impoverish and destroy labor itself—can be imagined, as the disintegration brought about by periodic strikes. On entering into competition with the several countries for the world's trade—as the way seems now opening for us to do—it is of first importance that continuity of labor and manufacture be secured. With such assurance, and a careful feeling of our way—over anxiety for immediate results always overreaching itself—there can be no doubt as to the future greatness of our foreign trade. It should also be borne in mind that the supremacy of the greatest commercial and manufacturing countries in the world is principally due to the able supervision, protection and direction of their trade by their governments. On the other hand, the American individual has had to do all for American commerce, the government perhaps abstaining too much from either directing or encouraging. It is only where a national principle permeates a republic that its national requirements, year by year, are attended to. It would seem, therefore, that the fostering, the developing and the directing of our commerce by the government should be laid down as a necessity of the first importance. With this protecting supervision and with the individual energy and ability of our business men concentrated and directed against all opposition, no limit could be set to the extension of our foreign trade.

The Louisville *Courier-Journal* says of the outlook for river navigation: More new boats will be built this year than have been during any year since the war. And it is just as we predicted years ago. While railroads all over the country are bankrupt and robbing each other by "cutting rates," the great rivers of the West and South continue to flow onward, bearing on their mighty bosoms magnificent and monster steamboats and room plenty and business crying for more. The river will live and boats run, and more be built, when railroads will rust, and locomotives be sold for scrap iron. If boats only had the chances that railroads have, and enjoy the privileges they do, what a good time steamboats would have. For instance, a railroad can owe $500,000, and trains run on time as usual, from one year's end to another; but a drunken negro rouster or a blackmailing deck hand can tie up a steamboat in 40 minutes for $1, and put her to more trouble in 10 hours than a common railroad in this country is actually worth.

The silver vault now in course of construction in the Sub-Treasury will be 47 feet in length by 24 in breadth, and 12 feet high, and will hold $40,000,000 in silver when finished. The cost of the iron and steel work employed in its construction was about $20,000 including the doors and their levers. The floor of the vault will be iron and steel 2 inches thick, and under this will be 4 feet of concrete.

Of 266 tin-plate mills of England, 204 are working while 42 are standing.

A Locomotive for War Purposes.—A series of experiments are about to be carried out at the Royal Arsenal, Woolwich, to test the efficiency of a special kind of locomotive engine which has been constructed for the new trench railway. This railway is designed to be laid upon the surface of the ground wherever it may be found necessary to construct earthworks or to transport material, the ordinary methods of reducing irregularities by cuttings and embankments being out of the question in field operations. The engine is, therefore, designed to ascend and descend sharp gradients, and is also fitted with an apparatus for hauling up and lowering loaded trucks. A hill too steep to be ascended with a load behind may be surmounted by the engine alone, and it may then wind up the load after it. An experimental railway running up and down hill in irregular fashion is being formed near the butts in the government marshes adjoining the Royal Arsenal, Woolwich, for the purposes of the trial.

The distress in the coal and iron districts of South Wales increases in magnitude and deepens in intensity, particularly in the neighborhood of the iron works. At Cardiff the workhouse is so overcrowded that the Guardians have ordered the board room and the adjoining rooms used as offices to be converted into dormitories. Of the 500 collieries in Glamorganshire and Monmouthshire, only 20 are working full time. At Penarth the docks are almost deserted. At the Ocean Collieries, Treorky, employing nearly 1000 men, the colliers worked only 13 days last month. At the Abergorke Colliery, another large colliery in the Rhondda Valley, the men have only worked 17 days within the last six weeks.

Special Notices.

SPECIAL NOTICE.

The undersigned offer their services as agents to
American Producers of Metals.
They represent foreign brands of
Zinc, Russia Iron, Hoop Iron, Window Glass, Cutlery and Guns.
LOUIS WINDMULLER & ROELKER,
90 Reade Street, N. Y.

Wanted—A Partner,

In a foundry and machine business, already well established. Locality splendid and healthy.
A practical man with means is wanted to join a practical man who is already well established.
Address ***CAR WHEEL FOUNDRY, P. O. Box 134, Selma, Alabama.***

MAY LIST, No. 2.

MACHINE TOOLS,
Second-Hand.

One Fishkill Landing Machine Co. 16 in.x36 Horizontal Steam Engine, with slide valve and cut-off.
One Portable Engine, 7 in. cylinder.
One Sellers 500 lb. Steam Hammer.
One 600 lb. Drop Hammer.
One Hand Milling Machine.
One "Pond" Index Milling Machine.
One Pratt & Whitney 2 Spindle Drill.
Three Chase Patent Pipe Cutting Machines.
One Ames Mfg. Co. 2 Spindle Profiling Machine.
Two Engine Lathes, 13 in. swing, 6 ft. bed. Two Engine Lathes, 22 in. swing, 8 ft. bed. One Engine Lathe, 76 in. swing, 36 ft. bed. One Engine Lathe, 15 in. swing, 6 ft. bed. One Engine Lathe, 15 in. swing, 7 ft. bed. One Engine Lathe, 22 in. swing, 16 ft. bed. Three Engine Lathes, 20 in. swing, 8 ft. bed. Two Engine Lathes, 22 in. swing, 8 ft. bed. Six Turning Lathes, 14 in. swing, 4½ ft. bed. Three 4-spindle Drills. One 36x36x9 ft. Planer. One 48x48x12 ft. Planer. One 8 in. Shaper. One Gear Cutter. One "Bement" No. 2 Cotter and Key Seat Drill. One new "Hardaway" Bolt Heading Machine, to head up to ⅞ in. bolts. One new "Hardaway" Bolt Heading Machine to head up to 1¼ in. bolts.
A lot of Wood Working Machinery.
Please specify which of the above tools you want and we will forward all particulars.
The above tools will be sold very low, and can be seen at

The George Place Machinery Agency,
121 Chambers and 103 Reade Sts., N. Y.

For Sale,
New and Complete STOVE FOUNDRY
AT
Lawrenceburgh, Dearborn Co., Ind.
(20 miles from Cincinnati, Ohio.)

This foundry is situated about one hundred yards from the Ohio River, at the junction of the Ohio and Miss. and Cin., Ind. and Lafayette railways. It was *finished* and *commenced running* about *three months ago*. It is one of the most *complete* and *substantial* factories of the kind in the West, and can be put into active operation in one day, everything necessary being on the premises, including Flasks, Patterns, &c.
I solicit and will receive proposals for the purchase of same until the 1st day of June next.
JOHN D. ABRAHAM, Assignee
of Samuel L. Yourtee & Co.
CINCINNATI, May 14, 1878.

Important to Manufacturers.
BISSELL & WELLES,
Auctioneers and Commission Merchants, No. 15 Murray St., New York,
Solicit from manufacturers and others consignments of Hardware and Cutlery for our weekly Auction Sales to the Trade, or at private sale for cash, as desired. Our facilities for moving large lines of goods are unsurpassed. Advances made if desired.

Hardware Salesman Wanted.

A young man, with some years' experience in the Builders' and retail hardware trade. Salary moderate, but a permanent situation for a capable young man of good address.
Address *HARDWARE, Box 4 on Post Office.*

The undersigned begs to inform his patrons and the public in general that he has acquired by purchase the business of MR. R. H. TRESTED, JR., and continues the same at the old stand. He has made large additions and improvements in his establishment, and is now prepared to undertake any kind of work connected with the business of
GOLD, SILVER AND NICKEL PLATING.
Any work entrusted to him shall always have his best attention, and he guarantees perfect satisfaction. Orders sent by express or mail will be promptly and carefully attended to. Best of City references given.
F. A. WOLFF, 59 Ann St.

Special Notices.

JENNINGS'S
COMBINATION DISCOUNT TABLES.
(Published by the author.)

This Book contains 1500 tables for single and combination discounts, such as 17½ %, 45 %, 10&7½ %, 15&5 %, 25&10 %, 33⅓&5&2 %, 35&7½&2 %, 45&5&10 %, 60&10&5&10 %, 65&5&10&2 %, 65&10&10 %, 75&15 %, &c., &c., which are so arranged as to be found without loss of time, and by their use either the **Discount** or **Net** on any amount of dollars and cents, from a penny to one million dollars, can be ascertained in a few seconds entirely by **Addition.** Just the thing for **making** or **proving invoices,** finding **Net Value** of goods bought or sold, and comparing different Discounts, thereby saving time, blunders and **headwork.**
(A copy can be examined in "The Iron Age" Exhibit at the Paris Exposition).

OPINIONS.

TOLEDO, O., April 15, 1878.
Mr. S. H. Jennings: DEAR SIR.—Your Discount Tables are received, and I think are all you claim for them, and that they will be appreciated by the trade. I have had inquiries from customers for something of the kind, and shall be pleased hereafter to recommend your book. Yours, very truly,
T. W. ROOT,
with The Russell & Erwin Mfg. Co.

MILLDALE, CONN., March 20, 1878.
We consider it a great help, and a book which every business house should possess.
CLARK BROS. & Co.

HOUSTON, TEXAS, April 8, 1878.
We find it saves a great deal of figuring.
DECHAUMES & DUNN.

HOT SPRINGS, ARK., April 10, 1878.
We find the Tables correct, and are highly pleased with it. Every merchant should have one of them.
FONES BROS. & CO.,
Hardware Merchants.

It will be mailed, postpaid, to any address, on receipt of the price, $3. Currency may be sent by **mail** at my risk. Address
S. H. JENNINGS,
Deep River, Conn.

S. H. JENNINGS,
Deep River, Conn., U. S. A.,
Offers his services to parties in any
FOREIGN COUNTRY
except Great Britain, who may desire to establish, build up, or increase a trade in **American Hardware, Agricultural Implements, Machinery,** and **Miscellaneous Goods,** as
EXPORT FACTOR,
at a low rate of commission. Correspondence solicited. He has had three years' experience as Purchasing Agent for
Messrs. WM. MARPLES & SONS,
Sheffield and *London, England,*
Jobbers doing business throughout Great Britain, and to whom he would with pleasure refer. By arrangement with them he will represent no other firm having a house or branch house in Great Britain, which includes England, Ireland, Scotland and Wales. He buys direct from **manufacturers,** and only for **export,** thus securing lowest possible prices. He will attend to all matters this side of the water, including Purchases, Shipments, Remittances, &c., and has facilities in New York City for securing prompt shipments at most favorable rates of freight. Manufacturers of goods suitable for Foreign Trade are invited to send in their circulars or catalogues, and quote "hard pan" prices for export, which will be considered confidential.

Second-Hand Tools and Engines.

One 14 in.x30 in. Adjustable Cut-off Engine, wheel 10 ft. diam., 20 in. face; one Horizontal Tubular Boiler, 54 in. diam.x16 ft., has 60 tubes 3 in. diam., full fronts; one 22 in. Double Belt, 68 ft. long. Above in first-class order, and will be sold cheap if purchased before removal; price. $1600.
One 26 in. swing x 17½ ft. bed Engine Lathe, back geared, screw cutting, rod feed, compound rest, power cross feed, steady rest 24 in. chuck, and 3 tool rest for shafting. In first-class condition, price, $400.
E. P. BULLARD,
Successor to BULLARD MACHINE CO., Limited,
14 Dey St., New York.

For Sale, To Let or Exchange
For other Property (Western preferred), Stock or Interest in an established Business,
On very reasonable terms, one of the finest pieces of property in the country for Foundry or general Manufacturing purposes, and consists of the following substantial brick buildings, situated corner Vail Ave. and North St., Troy, N. Y., viz., Moulding room, 132x74 ft., with large three-story building attached, 174x52 ft. The distance between floors and ceilings on each story is respectively 14, 12 and 10 ft., and are now used as mounting, store, sample and office rooms. Attached also is a two-story building, 90x45 ft., with engine and boiler rooms. On same grounds are sheds, barns and large yard. Attached to the property also are engine and boiler, main lines of shafting, elevators, &c. The property fronts on three streets. It will be sold, rented or exchanged, in part or together, and at very low price. Address
A. G. PATTON,
Columbus, O.
Or W. H. HOLLISTER, JR., Troy, N. Y.

Seldom Offered.

A chance to take an active interest in one of the largest and most successful steel works in this country. One strictly first-class business man to take charge of the finances, &c.; also one or two young men to assist in the general management of works, business, &c. To parties having means and ability, and who wish to engage in the manufacture of crucible and Siemens-Martin steel, no more desirable opening can be found.
All communications strictly confidential.
Address, *"VERITAS,"*
Office of *The Iron Age*, 83 Reade St., N. Y.

An Established House
Would like to have the agency for Spain of some American manufactories, with the view of introducing in that country American wares. Principals only need apply to **J. M.,**
No. 3984 P. O. B., New York City.
Satisfactory references must be exchanged.

WANTED.—A first-class business man familiar with machinery and manufacturing, capable of handling large bodies of men, desires a responsible position. References satisfactory. Address,
IRON AND STEEL,
Care of *P. O. Box 813, Bridgeport, Conn.*

Special Notices.

W. GARNER,
General Merchant,
Mouldsworth, near Chester, England,
Supplies nearly every class of Goods,
including all kinds of
Agricultural Machinery, Domestic Machines,
SEWING MACHINES
And Artificial Manures.

W. GARNER is open to represent any Foreign Manufacturers in England for the sale of their manufactures of whatever nature or kind. Having a wide and well established connection in the Provinces, could introduce some American, German and French products to mutual advantage.
W. GARNER is also open to buy any kind of Goods on commission, and ship them to any part of the world. Manufacturers or others desiring his assistance will please address (with full particulars in English) as above.

AUSTRALIA.
AMERICAN HARDWARE CO.,
No. 9 WILLIAM STREET, MELBOURNE, AUSTRALIA,
Solicit correspondence with American manufacturers desirous of representation in the Australian Colonies. Consignments will have prompt attention. References furnished.

The Bullard Machine Co., "Limited,"
have retired from business. Settlement of all accounts will be made by **H. A. V. POST,** Treasurer, 23 Nassau Street, who is authorized to sign "in liquidation." Our patrons are referred to the following notice.
BULLARD MACHINE CO., Limited.

I will continue the business in Machinists' Tools, Wood-working Machinery and Steam Engines, both new and second-hand, at the old stand of the late Bullard Machine Co., Limited, No. 14 Dey St.
E. P. BULLARD.

To Manufacturers and Jobbers of Hardware, Cutlery, &c.
Manufacturers and Jobbers, having surplus stocks or goods that from any cause are unsaleable upon which they wish to realize, or assignees who have stocks to dispose of, will find a cash purchaser by communicating with.
W. M. CALDWELL,
Dealer in
Job and Auction Lots of Hardware, Cutlery, &c.,
102 Chambers St., New York.

Wanted to Purchase.
A Punch for punching ⅝, ¾ and ⅞ wrought iron washers. *S. B. LOWE,*
Chattanooga, Tenn.

DROP FORGINGS.
The TRENTON VISE & TOOL WORKS, Trenton, N. J., having increased their facilities, are now able to do all kinds of
Iron and Steel Drop Forgings
in quantities to order at reasonable rates.
HERMANN BOKER & CO., Proprietors, 101 & 103 Duane St., N. Y.

HALSEY & MILLET,
Auctioneers and Commission Merchants
112 Chambers St., New York,
Solicit from manufacturers, importers and jobbers consignments of Hardware, Cutlery, House Furnishing Goods, &c. &c., for their regular weekly sales.
JAMES E. HALSEY, formerly of J. E. Halsey & Co.
CHAS. A. MILLET, formerly of Bissell, Welles & Millet.

For Sale.
Large Punch and Shears, N. Y. Steam Engine Co. make; two small Punches; 16x4½ feet Planer; number of Drills and a lot of tools suitable for architectural ironwork; Steam Engines and Boilers of all sizes at **JOHN CARROLL,**
266, 268 & 270 Front St., N. Y.

The Sherman Process Co.
9 Pemberton Square, Boston, Mass.,
Issue Licenses to use the Process for the Manufacture of Iron and Steel
In the Bessemer Converter, Crucible, Siemens-Martin, Puddling, Blast and Cupola Furnaces.
The use of this Process improves the quality of the product, saves fuel and labor, and does not require any change in furnace or manner of working.
See page 17 of *The Iron Age* of Oct. 25th, 1877.

Price Book
for General Hardware.
Half leather, $10; full leather, $12. Send for descriptive circular.
In use in nearly every State in the Union, and growing in favor every day.
BUELL LAMBERSON, 97 Chambers St., N. Y.

SPECIAL NOTICE.
The undersigned, in view of the **Paris Exhibition** of 1878, begs to inform his friends that he continues to make translations of Catalogues, Prices-current, Circulars, Correspondence, &c., from and into the
ENGLISH,
FRENCH,
GERMAN
and **SPANISH,**
and that he bestows special attention upon a strictly correct rendering of **Technical Expressions** in matters relating to **Machinery, Metallurgy, Hydraulics,** &c. The very best reference will be furnished from leading manufacturers in this city, Philadelphia and elsewhere, for whom he has translated. If desired, estimates will be procured for the setting up, electrotyping and printing of catalogues, &c., in the above languages
C. KIRCHHOFF,
Metal Reporter of The Iron Age,
83 Reade St., New York.

JUST ISSUED.

HOUSE DRAINAGE AND WATER SERVICE

In Cities, Villages and Rural Neighborhoods.

WITH INCIDENTAL CONSIDERATION OF MATTERS AFFECTING THE HEALTHFULNESS OF PREMISES.

By JAMES C. BAYLES,

Editor of "The Iron Age" and "The Metal Worker."

The Publisher of *The Iron Age* has much pleasure in announcing that he is ready to receive orders for this valuable work. Its scope and practical value will be seen from an examination of the following

TABLE OF CONTENTS:

CHAPTER I.—Hygiene in its Practical Relations to Health.
CHAPTER II.—Sewer Gas.
CHAPTER III.—Waste and Soil Pipes.
CHAPTER IV.—Traps and Seals, and the Ventilation of Waste Pipes.
CHAPTER V.—Water-Closets.
CHAPTER VI.—Service Pipes and Water Service in City Houses.
CHAPTER VII.—Tanks and Cisterns.
CHAPTER VIII.—The Chemistry of Plumbing.
CHAPTER IX.—Elementary Hydraulics Applicable to Plumbing Work.
CHAPTER X.—Sanitary Construction and Drainage of Country Houses.
CHAPTER XI.—Water Supply and House Service in Country Districts.
CHAPTER XII.—Suggestions Concerning the Sanitary Care of Premises.
CHAPTER XIII.—The Plumber and His Work.

This work exactly meets a demand which has been brought prominently to the notice of the Author and Publisher by the great number of letters sent them asking if such a book could be had. Taking up the subject of the Mechanics of Hygiene where the Engineer leaves it, the Author confines his attention closely to matters of practical interest and importance to the Plumber, the Architect, the Builder and the Householder. It is an exhaustive discussion of the **Theory and Practice of Plumbing** in all departments, and presents a vast amount of useful and valuable information in a clear, concise way, so that it will be understood by all classes of readers.

The work is fully illustrated with Wood Cuts, and large folded Plates photo-engraved from working drawings, showing examples of the best plumbing practice of the time. It contains 350 pages, elegantly printed on heavy paper, octavo size, and substantially bound in cloth.

Copies will be sent postpaid to any address on receipt of the price, $3.

Address,

DAVID WILLIAMS, Publisher,

83 Reade Street, New York.

Trade Report.

Office of THE IRON AGE,
WEDNESDAY EVENING, May 22, 1878.

There has been an easy money market the past week, and the ruling rate for call loans has been 3 % @ 3½ %, with 4 % occasionally made, though on first-class collaterals borrowers will not pay over 3½ %. Mercantile paper is quoted at 4 % @ 5 %, first-class names going readily at the lower quotation.

Gold has ruled at 100¾ most of the week, though on Monday and Tuesday it reached 100⅞.

The syndicate has advanced its price for the 4½ per cents. to 102¼, gold, and accrued interest, equivalent, with gold at 100¾, to about 104½, currency. The remaining $15,000,000 of 4½ per cents. necessary to complete the $50,000,000 bargained for on April 11 have not yet been taken from the treasury, although the syndicate have found buyers for a considerably larger amount than the $35,000,000 already taken from the government. Settlements are going forward satisfactorily and smoothly, and it will be observed that there is no stringency in the gold loan market and that the price of gold is easier for buyers than it was. The gold interest on the public debt, due within the next six weeks, or inclusive of July, amounts to $25,365,070.

The following table shows the course of the gold market during the week :

	Highest.	Lowest.
Thursday	100⅞	100¾
Friday	100¾	100¾
Saturday	100⅞	100¾
Monday	100⅞	100¾
Tuesday	100⅞	100¾
Wednesday	100¾	100¾

Government bonds are strong in all issues, with an advance on some of the series.

The stock market has been pretty quiet, and has even ruled dull at times, with the general list steady. The leading Western shares are firm and advanced, and Jersey and Erie are also strong. The less active shares close at a point below Wednesday's figures. Railroad bonds sell fairly and the market has ruled firm, with no special changes in the quoted list. State bonds are quiet and steady. We give the closing quotations below.

The last bank statement showed a loss of $1,693,225 in surplus reserve, thus reducing the amount held by the banks above the 25 % legal limit to $14,128,775. The specie decreased $4,439,300, the deposits, $1,351,900, and the circulation, $20,800, while the legal tenders increased $2,408,100, and the loans, $1,091,900.

The following shows the condition of the city banks this week, compared with the previous statement and with the statement for the corresponding week last year :

	May 11.	May 13.	Differences.
Loans	$232,030,700	$233,122,600	Inc.. $1,052,900
Specie	27,469,500	23,030,200	Dec. 4,439,300
Legal t'nd'rs	38,612,000	41,020,100	Inc. 2,408,100
Deposits	201,038,000	199,686,100	Dec. 1,351,900
Circulation.	20,033,100	20,012,300	Dec. 20,800

The foreign trade movements for the week are shown in the following tables :

FOREIGN IMPORTS.

For week ended May 18 :

	1876.	1877.	1878.
Total for week.	$6,393,015	$5,605,784	$3,931,806
Prev. reported.	121,644,108	123,223,860	108,790,331
Since Jan. 1	$128,037,123	$128,829,644	$112,722,137

Included in the imports of general merchandise were articles valued as follows :

	Quantity.	Value
Anvils	200	$1,610
Brass goods	18	1,796
Cutlery	41	15,416
Gas fixtures	2	97
Guns	31	4,777
Hardware	31	457
Iron, pig, tons	200	2,956
Iron, sheet, tons	5	391
Iron, other, tons	281	9,651
Metal goods	103	7,978
Nails	10	977
Needles	9	6,246
Nickel	2	739
Old Metal		441
Platina	1	5,101
Saddlery	6	1,528
Steel	548	10,684
Silverware	1	440
Tin, bxs	7,428	36,033
Tin, 6689 slabs	510,094	73,702
Wire	147	527
Zinc	55,604	2,759

EXPORTS, EXCLUSIVE OF SPECIE.

For week ended May 21 :

	1876.	1877.	1878.
For the week	$5,262,023	$5,518,535	$7,069,472
Prev. reported	86,313,052	96,353,476	126,632,598
Since Jan. 1	$91,575,075	$101,872,011	$133,702,070

EXPORTS OF SPECIE.

For week ended May 18 :

Total for the week	$93,583
Previously reported	7,603,690
Total since Jan. 1, 1878	$7,697,273
Same time in 1877	11,626,554
Same time in 1876	21,846,377
Same time in 1875	31,876,232
Same time in 1874	18,885,344
Same time in 1873	19,787,825
Same time in 1872	18,095,518

Government bonds at the close were quoted as follows :

	Bid.	Asked.
U. S. Currency 6's	120⅜	120¾
U. S. 6's 1881 registered	108⅛	108½
U. S. 6's 1881 coupon	108⅛	108½
U. S. 6's 1865 new reg	104⅛	104⅜
U. S. 6's 1865 cou	104⅛	104⅜
U. S. 6's 1867 reg	107⅛	107¼
U. S. 6's 1867 cou	107⅛	107¼
U. S. 6's 1868 reg	108½	109
U. S. 6's 1868 cou	109	109½
U. S. 10-40 reg	107¼	....
U. S. 10-40 coupon	107¼	107¼
U. S. 5's 1881 registered	105⅜	105½
U. S. 5's 1881 coupon	105⅜	105½
U. S. 4½'s 1891 registered	103¾	103⅞
U. S. 4½'s 1891 coupon	104⅜	104⅝
U. S. 4's 1907 registered	101	101¼
U. S. 4's 1907 coupon	101	101⅛

The following were the closing quotations of active shares :

	Bid.	Asked.
Atlantic and Pacific Telegraph	21⅛	22
Chicago and Northwest	50⅜	50⅝
" " Pref	72⅜	72
Chicago, Rock Island and Pacific	108¾	108¾
Chicago, Bur. and Quincy	103⅛	103⅛
Clev., Col., Cin. and Ind	27½	27¾
Cleveland and Pittsburgh	76	76¼
Chicago and Alton	75	75½
" Pref	99	100
Canton	16	20
Delaware, Lack. and Western	55⅜	55⅝
Delaware and Hudson Canal	55⅛	55½
Express—Adams	101	102
" American	49	49¼
" United States	46	47
" Wells, Fargo & Co	90½	91¼
Erie	12⅜	12¾
" Pref	22	23
Harlem	147½	148
Hannibal and St. Joseph	12	12½
" " Pref	28	28½
Illinois Central	78¼	78⅜
Kansas Pacific	8	8¼
Kansas and Texas	2¼	2½
Lake Shore	62½	62⅝
*Michigan Central	64¾	65½
Morris and Essex	80½	80¾
Milwaukee and St. Paul	51⅜	51⅝
" " " Pref	77½	77⅞
Mariposa	1	2½
" Pref	1¼	3
New York Central	108	108¼
New Jersey Central	22⅝	22¾
New Jersey Southern	⅞	1
Ohio and Mississippi	9¼	9½
Pacific Mail	18¾	18⅞
Panama	115	120
Pittsburgh and Fort Wayne	94	—
Quicksilver	16	16½
" Pref	32	33
St. Louis and Iron Mountain	6¾	7¼
St. Louis Kansas City Northern	4¾	4¾
" " " Pref	20¾	21
Toledo, Wabash and Western	14⅜	14½
Union Pacific	69⅜	69½
Western Union Telegraph	82⅜	82½

GENERAL HARDWARE.

The chief feature of interest in the trade this week is the advance in the price of Wood Screws, adopted by all the manufacturers at a meeting held in this city yesterday. The meeting was entirely harmonious, and the market is firm at the newly established rates, which will be found in the circular of the Russell & Erwin Mfg. Co., which we print below :

[*Circular No. 13.*]

SCREWS.

Our Circular No. 12, dated Dec. 27, 1877, is hereby annulled. Until further notice our discounts and terms for Wood Screws will be as follows, viz. :

Flat Head, Bright Iron	dis. 55 %
" Brass	50 %
Round Head, Iron	45 %
" Brass	35 %

Cash 30 days from date of invoice. No prices guaranteed.

We are also making the following varieties, for which we solicit orders :

Iron Screws.—Flat Head, Blued ; Flat Head, Japanned ; Flat Head, Bronzed ; Flat Head, Plated ; Round Head, Blued.

Brass Screws.—Flat Head, Bronzed ; Flat Head, Plated ; Round Head, Bronzed ; Round Head, Plated.

All Plated Screws will be furnished either nickel or silver-plated as ordered. We challenge comparison as to quality and finish and tests as to strength. We shall continue to fill orders as heretofore, at prices ruling at date of shipment.

RUSSELL & ERWIN MFG. CO.
NEW YORK, May 21, 1878.

The American Screw Company have reduced the price of Flat and Round Head Stove Bolts to discount 60 per cent. and regular Brass Side Knob Screws to 35 cents per gross net.

The Morse Twist Drill and Machine Company, New Bedford, Mass., have issued under date of 15th inst., a revised price list showing reduced prices for Drills, Reamers and Milling Cutters. We print below their new list for Bit Stock Drills, which is subject to the same discount as the old list, viz., 25 per cent.:

MORSE TWIST DRILL AND MACHINE CO.

New List, May 15, 1878.

Bit Stock Drills, for Metal or Wood.

Diameter.	Price per doz.	Price each.
1-16	$1.50	$0.14
3-32	1.65	.16
⅛	2.10	.20
5-32	2.60	.24
3-16	3.10	.29
7-32	3.60	.33
¼	4.10	.38
9-32	4.70	.43
5-16	5.40	.48
11-32	6.30	.54
⅜	7.20	.62
13-32	8.00	.68
7-16	8.80	.75
15-32	9.60	.82
½	10.30	.87
17-32	11.00	.92

Price per set, 1-16 to ¼ by 32ds, ¼ to ⅜ by 16ths, boxed, $2.60.

"Our Bit Stock Drills will fit any brace in the market, and will drill steel, iron or other metals as well as wood. They are not injured by contact with screws or nails, and will bore any kind of wood without splitting it."

The Nail market is in much the same condition as noted last week ; the demand is light, but at the same time is generally reported up to the average requirements of this season. The price remains nominally $2.50 net, for 10d. to 60d., but as we have before remarked, buyers of 50 to 100 kegs would have no difficulty in placing their orders at $2.40 net, and purchasers of large lots could obtain a further concession.

Sargent & Co. quote the Family Cherry Stoner at $6.75 per dozen, subject to discount 10 per cent. for prompt cash. They say of this machine : "The Family Cherry Stoner is a practical machine for preparing cherries for canning. It removes the stone and preserves the fruit and juice ; does not mash the fruit, but leaves the cherries as plump and round as they were before they were pitted."

The Penfield Block Works, Lockport, N. Y., have added to their line of specialties a Wood and Metal Lock Faucet, with adjustable key, which they illustrate in their advertisement on page 26. In the construction of this Faucet the composition spigot is used in combination with a nicely adjusted leather lining (an old and well tried method), and as the new features are all introduced above the water mark the security of the Faucet is in no way affected by the locking device. They quote these goods at the following list, which is subject to discount 40 per cent. H. B. Newhall, No. 11 Warren street, is their agent in this city.

	Per doz.
No. 1, 7½ in. long by ¼ in. on end	$4.00
No. 2, 9 " ¼ "	4.50
No. 3, 12½ " ⅜ "	5 00
No. 5, 18 " 1 "	7.50

After the great hotel fire in St. Louis last year inventors all over the country set their wits at work to make a fire escape adapted to such emergencies. So far as we have noticed their productions very few of them were suited to the wants of those who are likely to use them. They were too large, too costly or too weak to meet the popular demand. The Millers Falls Co., 74 Chambers street, have, after a series of very satisfactory experiments, placed on the market the Portable Fire Escape, which is illustrated in their advertisement on the 25th page. It is very simple in its construction and operation, is easily applied, and descending by its aid the speed is perfectly under the control of the user. The retail price of this Fire Escape, with 50 feet of braided linen rope of 800 lbs. tensile strength, is $2.50 ; the weight with rope is only 2 lbs.

Sidney Shepard & Co., Buffalo, N. Y., have in press a new price list for their full line of manufactures, which will be issued about the 25th instant.

Tennis & Wilson, No. 81 Beekman street, invite the attention of the trade to the "Paragon" Fly Trap, which is illustrated in their advertisement on page 12. They quote these goods at $3 per dozen, with special discounts for quantity orders.

Thos. E. Gaynor, Hardware manufacturers' agent, has issued a circular announcing his removal from No. 116 to No. 90 Chambers street.

IRON.

American Pig.—The condition of the Iron market is gloomy and depressed and the outlook, from the manufacturer's standpoint, is beyond question discouraging. It is openly stated by some of the leading Lehigh companies that at the present prices they are obtaining for their product they are sinking money ; how long this state of affairs will last and whether it is going to be a question of the survival of the fittest, meaning in this sense those who have the largest surplus, is a question that is being seriously asked. To-day there are rumors of embarrassment affecting one, if not more, of the large operators, but the particulars are withheld. Sales of various brands have been made during the week in moderate-sized lots, but we do not hear of any large transactions, and for round lots there is little inquiry. The prices realized for such sales as have been made are difficult to get at, but in many cases good Iron has been sold at lower prices than have yet been quoted in these columns. We quote : Foundry No. 1, $16.50 @ $18 ; Foundry No. 2, $15.50 @ $17, and Gray Forge, $14.50 @ $16.

Scotch Pig.—The market is dull and inactive ; the sales during the week amount to about 100 tons Coltness and 50 tons Eglinton, and the arrivals during the same time were 200 tons Coltness and 100 tons Eglinton. We quote, nominally, Glengarnock, $24.25 ; Eglinton, $23,50, and Coltness, $24.

Rails.—No transactions either in Steel or Iron Rails are reported since our last. We quote Steel, at mill, $43 @ $44, and Iron, according to quality, terms, &c., $32 @ $36.

Our attention is called to an error in our issue of April 25, announcing a sale of 25,000 tons of Bessemer Rails by the Joliet Steel Works at $26.50. This was an error of the types. The price was $46.50.—[EDITOR *The Iron Age*].

Old Rails.—The only sale we hear of is a lot of 150 tons of Old Rails at $17.50 here. We quote $17 @ $18 as the market price.

Scrap.—We hear of sales extending over the past two weeks amounting to 1000 tons, in lots, on private terms. We quote No. 1 Wrought, from yard, $20 @ $21.

METALS.

Copper.—Nothing has transpired in Copper ; the trade in this metal remains in the same dull state as last week ; there is neither a demand for consumption nor for speculation, and the price for Lake Superior is nominally 16½¢, and for Refined Ingot of the Copper Ore Mining and Smelting Company 16¢. Baltimore we quote 16½¢ @ 16¾, nominally. In order to effect sales of some importance, considerable concessions as regards prices would have to be made. As per cable advices from London, Best Selected has remained unaltered, £68.10/, while Chili Bars are now quoted £62.10/, indicating an advance of £1 per ton for the week. Capitalists in the metal branch in London have no doubt availed themselves of the late extreme depression and secured some supply ; hence this sudden reaction. If the political sky were clear we might look forward to some vigorous action on the part of larger operators for a rise on the other side ; everything, in fact, hinges on the question of peace or war at this precise moment. Mail accounts have just reached us from London, dated 11th inst., when Copper was in light request, with smelters willing to accept lower figures. Chili Bars were selling at the time at £60. 15/; Tough Ingots were worth £68 ; Best Selected, £69, and Sheet Copper, £73, less 3½ % free on board. The combination prices for Manufactured Copper are unchanged, and at these rates the demand continues on a fair scale. English Yellow Sheathing Metal is in only moderate request, but the price is steady at 14½¢. We quote : New Sheathing Copper, 26¢ ; Braziers', 28¢, and Bolts, 28¢ ; American Yellow Sheathing Metal, 20¢ ; Yellow Metal Bolts, 25¢, and English Yellow Sheathing Metal, 14½¢ @ 15¢, currency, in bond.

Tin.—This metal remains very quiet. We quote large lots, in gold, at the close as follows : Straits, 14¼¢ @ 14⅜¢ ; English Refined, nominally, 14½¢ ; Common ditto, 14¢, and Banca, 17¼¢ ; all gold. As per mail advices from London, dated 11th inst., there was no indication that production in Cornwall had slackened in the least in consequence of the low prices ruling. According to the Board of Trade returns the import into England during the first four months of the year had been 123,371 cwt., against 97,055 cwt. in 1877, while the export was 37,811 cwt., against 33,478 in 1877. By cable we learn that Straits was steady at £60. 10/, and that at Singapore it still stood, $18.25 ₱ picul, with an exchange of 3/11½. *Tin Plates.*—A cable dispatch announces that the reduction in the joint output alluded to in former reports of ours had been finally acceded to by the parties interested. Since this intelligence has reached us there is a much better feeling here, and we can quote the market at the close as follows, in gold, per box, ordinary brands, large lots : Charcoal Bright, $5.75 @ $6 ; do. Ternes, $5.37½ @ $5.50 ; Coke Tin, $5, and do. Ternes, $4.75 @ $4.87½, all gold. We receive from Liverpool by mail, under date of May 9, the following : "Charcoal Tins are steady ; Ternes are procurable at from 16/6 @ 16/9. Coke Tins are weaker, and 15/ is again a practicable price for a decent brand ; Ternes are procurable at 14/1½ @ 14/3, and Unassorted at 13/9. Shipments of Tin Plates to the United States during the first 4 months, 32,998 tons, against 32,565 in 1877 and 28,824 tons in 1876."

Lead.—The Lead market is in a wretched condition, and 50 tons Common Domestic have been sold at 3¾¢, currency, which could not be repeated to-day, for it would not be an easy matter to find a purchaser for a large lot even at 3¼¢, currency. At all events there is no buyer above 3¼¢, and there are but few at that, even for smaller lots. The stock here and in this immediate vicinity in first and speculators' hands is now 5000 tons, and the quantity afloat and to come by rail within the next six weeks, 2266 tons, constituting a total visible supply of nearly 7300 tons, while the entire trade is stocked for over a month to come. Unless something unforeseen of a remarkably favorable nature occurs, which we cannot discern for the present, prices would, under the circumstances, seem condemned to recede still further. Should they drop to 3¢, currency, a great effort would be made to further stimulate the export trade to Europe and China, and thus create an outlet sufficiently important if possible, in order to restore this metal to a more stable condition. Light will then once more break upon the now overcast Lead position. In England the market is flat, but no further decline is reported. The import during the first four months has been 32,216 tons, against 31,464 tons in 1877 ; the export, 11,546 tons, against 11,963 tons. They add to these statistics the following remarks, dated 9th inst. : "We quote good soft English Pig, £17 ; Sheets, £18. 10/ ; Pipe, £18. 15/, less 3½ % free on board ; soft Spanish, without silver, £16. 12/6, less 2½ % ex quay." There is some demand for Manufactured at our last quotations, viz., 5½¢ for Bar, 6¢ for Pipe, 6¢ for Sheet and 15¢ for Tin-lined Pipe, all less 10% to the trade.

Spelter and Zinc.—A good deal of dissatisfaction is expressed by some consumers of Domestic Spelter at the gradual lowering of quality as the price declines, some makers evidently endeavoring to lessen their loss by producing as inferior a kind of Spelter as they can get rid of. If they can prolong a precarious existence only by an increasing deterioration of quality, they will confer a favor on the community by stopping production outright. The desperate policy they have embraced will do them no lasting good, for a manufacturer will not care to make a bad experience over again, but rather pay ½¢ or ¾¢ more and be sure that he obtains an article doing him good service. The market is still inanimate and drooping, and we quote the range 4¾¢ @ 5⅛¢, currency, as to brand, for Domestic, and 5¾¢, gold, for Silesian, at which figure the latter may now be secured on a cable message. Of Refined Spelter 50 tons were taken for export at 8½¢, currency. The import into England during four months has been 104,010 cwts., against 75,000 cwts. in 1877 ; the export, 49,134, against 33,517 in 1877. *Sheet Zinc.*—There is some demand for Sheet, but trade is rather dull and prices more or less nominal. We quote Mosselmann, 7⅛¢ @ 7¼¢, gold, and Domestic, 6⅛¢ @ 6¼¢, currency.

Nickel—Is sustained both here and abroad, notwithstanding the rather increased production in Europe. We conclude from this that the demand expands with greater cheapness. We quote the same as heretofore, $1.30, currency, ₱ lb.

Antimony.—Cookson continues to bring 12¾¢, gold, while other brands have been sold, we are told, as low as 12¼¢, gold. London quotes Cookson £50 ; other brands, £49.

COAL.

The Board of Control held a meeting on Tuesday of the present week and adjusted various matters relative to the trade. It was decided that the amount of Coal mined this year up to July 1 should be 7,000,000 tons. For June the output is to be considerably larger than that of May. The June allotment is 1,740,000 tons, while that for May is only 1,305,000 tons. Mr. Saward's figures show that the companies did not come up to their allotments in March, which is the last month for which the figures have been received, by about 19,000 tons. Other months show still greater differences ; yet in the face of the fact that the country has not taken the past allotment, that for June has been largely increased. Some of the companies have advanced prices, apparently with the hope that by putting them up they may be able to get the old circular prices. From the fact that other companies adhere to the old figures, it seems probable that the proposed advance will not be immediately successful. The Lehigh Valley Company have not advanced their prices. The Delaware and Hudson Canal Co.'s prices are as follows :

Lump	$3.60	Egg	$3.75
Steamer	3.60	Stove	4.10
Grate	3.60	Chestnut	3.50

This is f. o. b. at Rondout, with boats towed up and down by the company. The Pennsylvania Coal Co. quote as follows for Coal at Newburgh, with 50 cents freight to New York :

Steamer, per ton of 2240 lbs			$3.45
Grate	"	"	3.45
Egg	"	"	3.60
Stove	"	"	3.95
Chestnut	"	"	3.40

Taking the situation as it stands at present, the prospect is not at all pleasing to the Coal companies or the dealers. Very little business is done, and mostly at figures below the quotations. Steam sizes are mostly called for.

IMPORTS

Of Hardware, Iron, Steel and Metals into the Port of New York, for the Week ending May 21, 1878 :

	Quan.	Value.
Hardware.		
Armstrong M. & Sons, Casks, 1		
Boker Hermann & Co. Hardware and cutlery, pkgs., 3		
Burkinshaw W. C. Cases, 4		
Bloomfield J. C. & Co. Casks, 4		
Baldwin Bros. Gun barrels, cs., 2		
Carey Samuel, Grindstones, 416		
Fuller Bros. Cases, 1		
Folsom H. & D. Guns, cs., 5		
Hammacher A. & Co. Wire, cs., 3		
Hildick A. H. & Co. Anvils, 65		
Livingstone W. & F. Grind and millstones, 1922		
Lamarche H. Arms, cs., 12		
Lesher, Whitman & Co. Cases, 1		
Owen A. Cases, 2		
Osborn W. H. Cutlery, cks., 1		
Paillard M. J. & Co. Packages, 3		
Schoverling & Daly, Gun caps, cs., 6 Guns, cs., 8		
Schuyler, Hartley & Graham, Guns, cs., 1 Gunwads, &c., cs., 80		
Thornton John & Co. Cases, 1		
Van Nest A. R. & Co. Casks, 3 Cases, 1		
Wiebush & Hilger Hardware Co. Cutlery and hdw., pkgs., 13		
Zoebisch C. A. & Son, Packages, 2		
Order, Packages, 3		
Iron.		
Geisenheimer & Co. Ferr'm'g'se, cs., 252		
Henderson Bros. Pig, tons, 200		
Hope H. Bundles, 140 Plates, 61		
Jansen, J. A. Spiegel, kilos., 152,413		
Mason J. W. & Co. Wire rope, coils, 14		
Mitander Nils, Blooms, pcs., 748		
Naylor & Co. Bars, 5113 Pig, tons, 200		
Wall P. F. Wire rods, pkgs., 207		
Wright J. & Co. Bundles, 260 Casks, 1 Bars, 4		
Order, Spiegel, tons, 250 Pig, tons, 100 Sheet, bdls., 90		
Steel.		
Brown Wm. Cases, 26 Bundles, 98		
Woodford W. O. Bundles, 160 Bars, 25		
Wusel Augustus, Cases, 32		
Order, Casks, 20 Cases, 2 Bundles, 38 Rods, bdls., 160 Tyres, 4		
Metals.		
Byrne Joseph & Co. Tin plates, bxs., 734		
Bruce & Cook, Tin plates, bxs., 600		
Cort N. L. & Co. Tin plates, bxs., 200		
Drexel, Morgan & Co. Tin plates, 1738		
Hurst F. W. J. Tin plates, bxs., 438		
Hopkins E. T. Tin plates bxs., 305		
McCoy & Co. Mdse., cs., 4		
Meyer Moritz, Lead, bars, 4683		
Merchant & Co. Antimony, cks., 8		
Moore D. & Co. Tin plates, bxs., 399		
Naylor & Co. Tin plates, 639		
Pratt Chas. & Co. Tin plates, bxs., 956		
Phelps, Dodge & Co. Tin plates, bxs., 12,114 Banca tin, slabs, 300		
Squires Edw. Scrap cop'r, cks., 3		
Order, Tin plates, bxs., 6257 Spelter, plates, 1738 Antimony, cks., 32 Tin, cs., 14 Copper ore, bags, 117		

EXPORTS

Of Hardware, Iron, Machinery, Metals, &c., from the Port of New York, for the Week ending May 21, 1878.

	Quan.	Value.
Hamburg.		
Copper, cks	99	$20,770
Hdw., cs	532	4,284
Mach'y, cs	23	3,311
Wringers, pgs	23	250
C'ge mtl., pgs.	7	65
Pl'td ware, cs.	3	181
Ag. imp., pkgs	261	22,175
Spelter, slabs	2909	9,600
Guns, cs	2	210
Sew. mach, cs.	7	641
Pumps, pkgs.	17	639
Bremen.		
Ag. imp., pkgs	302	8,575
Mach'y., pkgs	74	2,000
Hdw., pkgs	60	1,405
Wheels, case.	1	108
Rotterdam.		
Hdw., pkgs	66	1,201
Mf. iron, pkgs	29	494
Sew. mach., cs	71	640
Ag. imp., pkgs	15	1,151
Glasgow.		
Belting, cs	5	1,197
Ag. imp., pkgs	450	8,250
Mach'y, case.	1	25
Hdw., pkgs	23	391
Sew. mach. cs.	1	30
London.		
Hdw., cs	342	7,430
Guns, case	1	75
Brass w'rk, cs.	4	500
Ag. imp., pkgs	178	4,530
Mach'y, cs	74	4,316
Refrigerators.	4	200
Car wheels	56	448
Sew. mach., cs	20	2,011
Havre.		
Ag. imp., pkgs	939	25,542
Mach'y, cs	5	1,100
Copper, bbls.	234	48,000
Liverpool.		
Mach'y, pkgs.	26	9,700
Hdw., pkgs	110	4,700
Ag. imp., pkgs	125	10,620
Wringers, bxs.	8	170
Cutlery, cs	2	300
Wheels	78	780
Mf. iron, pkgs.	3	60
Iron rolls, cs.	4	240
Sew. mach., cs	50	920
Pumps, pkgs.	8	115
British North American Colonies.		
Ag. imp., pkgs	100	266
Gas fix'res, cs.	12	650
Mach'y, pkgs.	22	4,008
Brass g'ds, cs.	3	110
New Zealand.		
Wringers, pgs.	13	413
Mach'y, pkgs.	80	10,580
Ag. imp., pkgs	180	4,744
Nails, kegs	59	191
Locomotives	6	57,668
Arms, case	1	80
Mf. iron, pkgs.	239	2,538
Pl'td w're, pgs	58	9,570
Pumps, pkgs.	40	2,171
Cutlery, cs	8	467
Hdw., pkgs	484	10,768
Tank	1	451
British West Indies.		
Hdw., cs	78	1,115
Iron, tons	430	241
Nails, kegs	72	233
Mach'y., cs	4	238
C'ge mtl. pkgs	43	548
Mf. iron, pkgs	4	41
Coal, tons	60	180
British Honduras.		
Hdw., cs	36	600
Nails, kegs	37	99
Iron safe	1	240
Mf. iron, pkgs	14	118
French West Indies.		
C'ge mtl., pgs	8	310
Hdw., cs	1	150
Sew. mach., cs	3	55
Tinware, cs	7	179
Cuba.		
Sew. mach., cs	5	78
Coal, tons	470	1,760
Brass, bbls.	94	8,500
Ag. imp., pkgs	13	706
Grindstones	100	76
Nails, kegs	215	544
Mach'y, pkgs.	10	810
Hdw., cs	40	524
Mf. iron, pkgs.	15	94
Lisbon.		
Revolvers, cs.	2	60
Burners, case	1	96
Ag. imp., pkgs	9	1,100
China.		
Gas fixt., cs	2	200
Copper, bbls.	53	10,600
Sew. mach., cs	8	40
Mf. iron, pkgs.	4	150
Japan.		
Mf. iron, pkgs	3	121
Nails, kegs	178	589
Hdw., cs	23	940
Hayti.		
Mf. iron, pkgs.	16	132
Railroad cars.	4	1,200
Nails, kegs	36	96
Mexico.		
Ag. imp., pkgs	26	1,065
Cartridges, cs.	5	184
Hdw., cs	50	1,925
Sew. mach., cs	10	1,674
Pistols, cs	4	2,210
Cutlery, cs	12	813
Tinware, cs	3	65
Steel, pcs	25	703
Mf. iron, pkgs.	153	611
Arms, cs	1	462
Pumps, pkgs.	10	316
Tacks, cs	6	252
Revolvers, cs.	2	3,170
Mach'y, pkgs.	14	1,030
Cars	3	3,400
Wire, pkgs	47	336
Iron safe	1	45
Hdw., cs	39	1,056
United States of Colombia.		
Mach'y, pkgs.	10	399
Sew. mach., cs	58	1,373
Ag. imp., pkgs	11	540
Guns, case	1	40
Cartridges, cs.	2	44
Arms, case	1	80
Pumps, pkgs.	8	158
St'p'd w'e, pgs	23	602
Mf. iron, pkgs	21	152
Cutlery, cs	56	1,349
Hdw., cs	68	1,016
Revolvers, cs.	3	467
Pl't'd ware, cs.	1	307
Iron, pkgs	28	64
Venezuela.		
Ag. imp., pkgs	12	105
Wheels, pair.	1	59
Hdw., cs	11	1,288
Revolvers, cs.	1	228
Sew. mach. cs	10	464
Mach'y, pkgs.	9	321
Steel, pkgs	4	63
Brazil.		
Nails, kegs	110	274
Sew. m'ch., cs.	1	52
Mach'y, pkgs.	9	600
Hdw., cs	75	910
Pumps, pkgs.	2	126
Cutlery, cs	46	431

OLD METALS, PAPER STOCK, &c.

Business in this market still continues very dull, and we have nothing new of any consequence to report. The demand for Old Metals, Rags and Paper Stock is very light, and dealers are unable to dispose of any considerable quantity, no matter how great the concessions may be.

The purchasing prices offered by dealers for Old Metals are as follows :

Copper, heavy	per lb.	$0.12½	@ ..
Copper Bottoms	"	.10½	@ ....
Yellow Metal	"	.10	@ ....
Brass, heavy	"	.09½	@ ....
Brass, light	"	.08	@ ....
Composition, heavy	"	.11½	@ ....
Lead, solid	"	.02¾	@ ....
Tea Lead	"	.02½	@ ....
Zinc	"	.02¾	@ ....
Pewter, No. 1	"	.09	@ ...
Pewter, No. 2	"	.07	@ ...
Wrought Iron	pr ton.	$16.00	@ ....
Light do	"	9.00	@ ....
Stove Plate	"	9.00	@ ....
Machinery do	"	10.00	@ ....
Grate Bars	"	3.50	@ ....

The prices current for Rags, &c., are as follows :

Canvas, Linen	per lb	3 c.	@ 3½c.
" Cotton, No. 1	"	5 c.	@ ....
" " No. 2	"	2½c.	@ ...
White, No. 1	"	4½c.	@ ....
" No. 2	"	2¾c.	@ ....
Seconds	₱ lb.	2 c.	@ ....
Mixed, Woolen	"	2 c.	@ 3 c.
Soft, do	"	5½c.	@ 6 c.
Gunny bagging	"	3 c.	@ ....
Jute butts	"	2¾c.	@ .. .
Kentucky bagging	"	3 c.	@ ....
Book Stock	"	2½c.	@ ....
Newspaper Stock	"	1¾c.	@ 1½c.
Waste Paper and Scraps	"	1½c.	@ ....
Kentucky Bale Rope	"	4 c.	@ ...
Oakum Junk, No. 1	"	4½c.	@ 5 c.
" No. 2	"	3 c.	@ ...
Tarred Shaking	"	1 c.	@ 1¼c.
Grass Rope	"	..	@ 2½c.

PHILADELPHIA.

Office of *The Iron Age*, 220 South Fourth St. }
PHILADELPHIA, May 21, 1878. }

Business continues unusually dull, and complaints of the long-continued depression seem to be on the increase. There is a growing feeling, however, that the country has reached the lowest point of depression, and there are many indications which seem to warrant the anticipation of an early revival of business. The continued demand for our agricultural products at reasonably satisfactory prices, as shown by the increased value of exports, may be considered evidence of this. The prospects of abundant crops again this year is another favorable indication. The increased earnings of railways, the extension of some, and the projection of other new roads are important features, and are by no means exceptional. The condition of business at the rail mills shows more general activity than for a long time past. The car builders are fairly employed, and, in addition to important orders recently placed, others are in the market and will probably be placed at an early date. At the Baldwin Locomotive Works the demand is not specially active, but orders drop in steadily, enabling the company to keep their immense establishment constantly at work.

The recent sales of steamships will no doubt lead to considerable activity in shipbuilding, but it is unlikely that contracts of this character will be made public. The inquiries from shipbuilders for Plate Iron, however, show that contracts are being made, and there is no reason to think that the recent completion of two or three large steamers on the Delaware will lead to immediate inactivity. On the contrary, an important revival in the trade seems imminent, although it is reported that Messrs. Roach & Son are reducing the number of their hands.

In tools, agricultural implements and various hardware specialties a large business is being done, and the manufacturing establishments of such firms as Disston's, the Enterprise Manufacturing Company, B. Rowland & Co., and others of that class, report considerable activity, with an average of sales much larger than during the corresponding period of last year. The Enterprise Manufacturing Company have found their present extensive establishment entirely too limited for their business, and are now building a three-story extension of 140x45, to be used for office and warerooms. The company expect to have the building ready for occupancy in the course of a couple of months, when we hope to give a detailed description of their establishment, which is already one of commanding importance, and gives promise of continued rapid growth.

Pig Iron.—Since date of our last report the market has been gradually settling down, and sales of all grades have been made at a lower range of prices than any heretofore reported. The trade is so demoralized that it is almost impossible to give quotations fairly representing the actual condition of the market. The leading brands are not pressed for sale, but there is no doubt if offers could be obtained for large lots sellers would be willing to meet the market. In the present condition of affairs, however, it is evident that business cannot be forced, unless at a ruinous sacrifice in prices, and in several instances of this kind within the past few days transactions have been made at a full dollar per ton below our lowest quotations. In No. 1 Foundry sales are reported at a difference of $3 per ton; that is, the highest priced sale reported is something over $19, and the lowest but a fraction over $16. The same disparity may be found in Forge Irons, the difference being in the character of the brand and the necessity of the seller. It must be conceded, however, that very little Iron can be sold at the high figures named, and only in special cases can purchases be made at the low figures, but there has been sufficient business done of this character to unsettle the market and cause a feeling of doubt and uncertainty, and the trade throughout seem to be waiting further developments before entering into further operations. In the meantime some general decline in prices seems inevitable, and what at the moment appears to be irregular transactions may in a short time become regular market rates. We continue last week's quotations, which, however, are nominal, as follows: No. 1 Foundry, $18 @ $19; No. 2, do., $17 @ $17.50; Gray Forge, $16 @ $17; Mottled, $15 @ $15.50.

Ores.—Magnetic Iron Ores are quoted at $2.50, f. o. b. at Hacklebarney mines, for "Blue" Ore, hand broken and selected. "Red" Ore, price $2.75 f. o. b., cars.

Blooms.—The market is dull and weak, and sales cannot be made to any extent unless at some concessions from our quotations. We note several transactions at about $1 to $2 below quoted rates, which may be considsidered almost nominal. We quote: Sunken Scrap Blooms (2464 lb), $42 @ $45; Northern Ore Blooms (2240 lb) $37 @ $39; best quality Charcoal Billets (2240 lb) for, wire and steel purposes, $50 @ $55; Bars do, $65 @ $67.50; Sheet Iron Blooms, cornered (2464 lb) $58 @ $60; Cold-blast Charcoal Plate Blooms, $53 @ $55; run-out Anthracite, $50 @ $52.50.

Muck Bar.—There is no demand, and no sales have been reported for some time past. Sellers ask equal to $30 or $33, Philadelphia delivery, according to quality.

Plate and Tank Iron.—While there is nothing specially encouraging to note, the demand for small lots during the week has been quite active, and orders have been entered sufficient to keep the mills fully employed during the current month. Prices are much demoralized, however, and in the eagerness to secure further business prices have been reduced until there is no possible margin for profit. There has been some inquiry for Plates for ship and bridge building purposes, and it is likely that business will result, but to what extent is very uncertain. We continue our last week's quotations, which are a fair indication of the market, although for large lots sellers would no doubt make concessions. We quote. Common Plates, 2.2¢ @ 2.3¢; Tank Iron, 2.3¢ @ 2.5¢; C. No. 1, 2.4¢ @ 2.6¢; Shell Iron, 2.75¢ @ 2.9¢; Flange Iron, 3.75¢ @ 4¢; Solid Firebox, 4.85¢ @ 5¢; and Best Bloom, 5.5¢ @ 6¢.

Sheet Iron.—Business has been dull and inanimate throughout the week, and sales have been confined to small lots for immediate use. Prices are weak, and liberal concessions would be made to buyers of large lots. We quote nominal rates as follows: Refined Sheet Iron, No. 25 to 28, 3.4¢ @ 3.5¢; No. 22 to 24, 3.3¢ @ 3.4¢; No. 16 to 21, 3.2¢; Best Bloom Sheets, No. 25 to 28, 5.2¢ @ 5.4¢; No. 22 to 24, 5¢; No. 16 to 21, 4.7¢ @ 4.8¢; Common Red Plates, 5-16 to 18, 2.4¢ @ 2.5¢; Refined Plates or Blue Annealed, 5-16 to 18, 2.5¢ @ 2.6¢; American, R. G., 5-16 to 18, 3¢ @ 3.1¢; Best Bloom, 5-16 to 18, 4.9¢ @ 5¢; Philadelphia Russia, 6¢ @ 6.5¢; A. Patent Planished, 10½¢; B. Patent Planished, 9½¢; Bloom Galvanized, 40 %; Refined Galvanized, 50 %.

Bar Iron.—The market continues dull, and prices are said to have declined slightly. This is probably incorrect, so far as regards the best brands, although it is likely that purchases of Iron have been made at lower figures than formerly. Quality, however, has been made in proportion, and we have no reason to think that Best Refined Iron has been sold under 2¢, although good Iron has been sold at 1.8¢ @ 1.9¢. Competition from outside sources has been keener than usual during the past 10 days, and some orders have been placed at medium figures with parties who "guarantee quality," whatever that may mean. Profits have been cut so close that a tenth of a cent ₱ lb at first sight appears quite an object, but it has frequently proved poor economy to sacrifice quality under any circumstances. In this vicinity manufacturers are careful in defining the quality of their products, and, as a rule, are willing to sell the article on its merits, without claiming that common or medium qualities are "guaranteed quality," or anything beyond what it really is, viz., good as can be made at the price. We quote: Best Refined, 2¢; Medium, 1.75¢ @ 1.85¢, and Common, 1.5¢ @ 1.6¢.

Structural Iron.—The condition of the trade is unchanged; the mills are all fairly employed, and with several important orders in the market the outlook is quite encouraging. We cannot report any large sales since date of our last report, but there are inquiries in the market for several thousand tons, all of which it is believed will be closed during the current month. For obvious reasons we withhold details until the contracts are definitely placed. We continue former quotations as follows: Angles, 2.25¢ @ 2.50¢; Tees, 2.50¢; Beams, 2.7¢ @ 2.8¢; Cannels, 2.7¢ @ 2.8¢.

Steel Rails.—The market has relapsed into a quiet condition, and no sales of any amount have been reported for some days past. The reason for this, as was explained last week, is that high prices are asked for prompt deliveries, while special inducements are offered to buyers who will accept deliveries to suit the seller. This condition of affairs does not stimulate business; those who would purchase require prompt delivery, and as manufacturers are not in a condition to accept large orders on these terms, transactions have been limited, and offers to sell for fall delivery have not been entertained to any extent. We quote about $43 to $45, cash, at mill, according to location, with somewhat lower figures for deliveries in the fall.

Iron Rails.—The market has been a little quiet since date of our last report, although there are orders likely to be placed within a few days. Some sales of small lots have been made, and one lot of 5000 tons is reported as sold for Western delivery, but details of the transaction have not been made public. The continued inquiries from new sources seem to indicate an improving business at the rail mills, and as most of them have already a fair amount of orders on hand, the outlook is considered quite encouraging. We continue our late quotations, say $32 @ $34.50 at mills, according to section, quality and terms of payment.

Old Rails.—The market continues dull, and no sales of importance have been made for some time past. Good qualities are said to be saleable at $20, while other descriptions are dull at $18.50. There are no large lots on the spot, so that the market may be considered nominal. With lower prices in other departments of the Iron trade, it is not unlikely that lower figures may prevail for Old Rails, as buyers at the present time are not disposed to anticipate their wants. We quote prices nominal at $18.50 @ $20.

Scrap Iron.—There is a fair demand and prices are steady and unchanged. Sales, according to quality, Wrought, $21 @ $23; Cast, $14 @ $15.50.

Nails.—The demand is fairly active, but prices have been placed at $2.40 to the trade and $2.50 to consumers.

Lead.—The market is dull and inactive, with Common Domestic quoted at 3½¢. Manufactured is steady at 5¼¢ for Bar, 6¢ for Pipe, and 6½¢ for Sheet. Shot is moderately active as follows: Chilled, 9¢ @ 10¢; Drop, 7½¢ @ 8½¢; Buck, 8½¢ @ 9½¢, all less the regular trade discount of 10 %.

PITTSBURGH.

Office of *The Iron Age*, 77 Fourth Avenue, }
PITTSBURGH, May 21, 1878. }

There has been no improvement in general business during the past week, and while the volume is not much below that of same time last year, competition continues as strong as ever and the margin for profit is small, and herein is the chief cause of complaint. The demand for almost everything continues of a hand-to-mouth character. Neither jobbers nor consumers are disposed to carry large stocks, and sellers are drawing the lines closer than ever, refusing to sell to those at all doubtful except for cash. This, however, is not surprising in view of the numerous failures recently and the heavy losses entailed thereby. Many good men and good firms have been crippled and others ruined by heavy losses incurred by the failure of their debtors, and it is not strange, therefore, that there is a very general disposition to refuse to sell on time to any who are at all doubtful; but for this the volume of business could be largely increased. Our merchants and manufacturers have come to the conclusion that their goods are much better than doubtful book accounts, and men who a few years ago were considered gilt-edge and could obtain all the goods they wanted on time, are now compelled to pay cash upon delivery.

The recent cold snap, together with the accompanying frosts, occasioned considerable uneasiness, as it was feared the crops had been seriously damaged. In this section of the country, while early fruit and vegetables have been more or less damaged, particularly in the low lands, the grain crops have sustained but little injury, and the indications are still very favorable for a splendid harvest.

Pig Iron.—There has been no improvement in business during the past week, and what is still worse, but little prospect of any immediate change for the better; on the contrary the market, so far as the producing interest is concerned, is in a more unsatisfactory condition now than it has been at any time yet. Since the first of the year there has been a decline here of about $2 per ton, with but little if any difference in the cost of production; ores remain unchanged, while labor and fuel are about the same. Cheaper ore, however, is not improbable within the next few months, as but few of the ore companies have contracts of any consequence as compared with the same time in former years, and with stocks accumulating some of them will no doubt, sooner or later, be willing to make concessions in order to effect sales. Ore has been much higher relatively than Pig Iron all this year, and as there is no prospect of any immediate advance on the latter we are inclined to the belief that cheaper ore is only a question of time. The strong argument made by ore companies against reducing the price of ore is that it would be of no advantage to furnacemen—that it would result in a corresponding reduction in the price of Pig Iron; but be this as it may, it is about as certain as anything can be that without cheaper ore a general suspension of the furnaces in the West appears inevitable. Prices may be quoted nominally as follows:

BITUMINOUS COAL SMELTED.

Foundry	4 mos.	$19.00 @	$21.00
Gray Forge, Red Short	"	18.00 @	18.50
" white and mottled	"	16.50 @	17.50

HANGING ROCK CHARCOAL.

Mill	4 mos.	$20.00 @	$22.00
Foundry, Nos. 2 and 1	"	23.00 @	26.00
Cold Blast	"	35.00 @	38.00
Eastern Cold Blast	"	28.00 @	30.00

COKE IRONS.

Gray Forge, accord. to qual.	4 mos.	$15.50 @	$17.00
Foundry " " "	"	18.00 @	20.00

Bessemer Iron continues dull, and the market is weak with a drooping tendency. We understand that while there is not much disposition to press sales, there is no difficulty in buying at $19.50, 4 mos., and it is possible that a bid of the even $19 would not be rejected. The Steel Rail mills, the chief buyers, are all reported pretty well stocked for the present depression.

Manufactured Iron.—The market continues in a very unsatisfactory condition, with but little prospect of any immediate change for the better. Business usually commences to fall off in the latter part of May, and we do not look for any general improvement until after harvest. There is reason to believe, however, in view of the heavy immigration westward, and if the crops turn out anything near as well as expected, that there will be an increased demand for all kinds of manufactured Iron this fall, and it is sincerely hoped that with increased consumption manufacturers will be able to obtain remunerative prices. It is worthy of notice that nearly all our manufacturers are making specialties of some kind or other, and but for these, on which there is still a margin for profit, they would be much worse off than they are. As ore is higher relatively than Pig Iron, mill men aver that Pig Iron is bringing more money relatively than the ordinary grades of finished Iron, and thus it will be seen that the one has but little advantage over the other. Pittsburgh, in order to meet competition, is obliged to give bed-rock prices, and this her manufacturers are doing in order to hold their trade, in expectation that when times become better they will be enabled to get back some of the money they are now losing. We continue to quote upon a basis of $1.65 @ $1.75, 60 days, for bars.

Nails.—There is nothing new to record, while the demand is only moderate. The factories both here and at Wheeling are all in operation, most of them working full time, and stocks at both points are down lower than they have been at this particular time for many years. This is explained by the fact that from December until the 1st of May all the mills in the West worked but half time, and many of them had considerable difficulty for some time past in filling their orders. Whether the present arrangement will be continued or not will be decided at the next meeting of the Western Association, which meets on the second Wednesday of June. While there has been no change made in the card, selling rates may be quoted at $2.30, 60 days, with 2 % off for cash. Some manufacturers still quote card rates, but we incline to the belief that they are not selling any.

Horse and Mule Shoes.—There is no change to note in prices, and trade is reported fair only. Juniata brand still quoted in 100-keg lots at 3¼¢ and 4¼¢ ₱ lb, cash.

Steel.—There is a continued fair degree of activity. Mills generally have about all they can do, and the outlook is favorable for a good summer and fall trade. The consumption of American Steel is increasing every year. Owing to its cheapness it has virtually driven the imported article out of the American markets. And, moreover, for the same reason, it has for many purposes supplanted Iron. Tool Steel, 11¢ @ 13¢, according to quality; Spring do., 6¢ @ 7¢; Tire Steel, 4¢ @ 5¢; Boiler Plates, 7¢ @ 8¢.

Wrought Iron Pipe.—The discount off regular list on butt welded Pipe is still quoted at 60 @ 65. The mill of Rhoods & Potter, formerly Wm. Graff & Co., is being transformed from a butt to a lap-welded mill, and will be started up as soon as completed. The demand for oil-well tubing and casing continues light for the season, owing to the depression in the oil market, and manufacturers have lost so much in the oil regions that they are now refusing to sell except for cash.

Rails.—There is no change to note in prices for Steel Rails—$44, cash, delivered on cars at works. The Edgar Thomson Company is well supplied with orders and refuse to make any concession whatever from above quotation. The stock of old Iron Rails in this market is light, but the inquiry is only fair, and prices remain about as last quoted, $20 @ $21, cash, according to quality.

Scrap.—The Scrap trade continues quiet, although all that can be expected; no material change in prices recently. No. 1 Railroad Wrought Scrap, $22 @ $22.50; Boiler Scrap, $23 @ $24; Blacksmith do., $21 @ $22; Stove Metal, $10; Machinery do., $16 @ $16.50; Wrought Turnings, net, $15; Cast Turnings, $11; Car Springs, $35 @ $38; Car Wheels, $19 @ $20. Stocks here, although not large, are equal to the demand.

Window Glass.—There is a fair business for the season, but no improvement in prices, which are very unsatisfactory. We continue to quote, in car-load lots, at 70 and 10 @ 75, straight.

Coke.—There is no abatement in the demand for Coke, which may be attributed to its cheapness, causing it in many places to take the place of Coal. Selling at $2.15 @ $2.17 ₱ ton, delivered free on cars in Pittsburgh.

Coal.—Some of the collieries in the Monongahela Valley have resumed, the miners having consented to a reduction of ½¢ ₱ bushel. The price now paid for mining is 2½¢ ₱ bushel. The down-river markets are well stocked, but owing to its cheapness a largely increased consumption is looked for.

CHATTANOOGA.

Office of *The Iron Age*, Market and 8th Sts., }
CHATTANOOGA, May 21, 1878. }

We have fairly entered upon our summer business in this latitude, which is always marked by moderation, if not by dullness. The complaint of stagnation in the Eastern Coal trade is duplicated in this district, and there being no combinations possible here, it is every operator for himself. One extensive miner and dealer said the other day: "I have about 300 hands whom I must keep going at some profit if possible. If I make no more than 50¢ on a car load of Coal it is that much toward feeding my men. It will readily be understood that this condition and feeling must bring the price of Coal and Coke to the lowest terms. There is nothing new to note in Pig Iron, except a rather improved demand for car wheel metals. Other branches of the trade continue much as heretofore. The week opened unusually cold, visiting some of the low lands with sharp frosts. It ends in hot, sultry weather and promises of rain, which is needed.

Pig Iron.—There is nothing of interest to note, except that the furnacemen are striving to improve the quality of their products with very fair showing of success. The supply of Foundry is now full, whereas we were complaining of its meagerness in these reports a few weeks ago. We quote: Coke Irons—No. 1 Foundry, $17 @ $18; No. 2, $15 @ $16; Gray Forge, $13 @ $14; White and Mottled, $11@ $12. Hot Blast Charcoal—No. 1 Foundry, extra, $20 @ $21; do., $18 @ $20; No. 2 Foundry, $16 @ $18; Gray Forge, $15 @ $17; White and Mottled, $15. Cold Blast Charcoal—Car Wheel Metal, $22.50 @ $27.50; do., Extra Standard, $24.60 @ $29.50; Forge, $17.60 @ $22.

Muck Bar.—$27 @ $34: Old Rails, $16.50 @ $17.50. Old Car Wheels, $18.

Ores.—Brown Hematite, 50 to 56 %, ; ₱ ton, $1.75 @ $2.25. Red Fossiliferous, 50 to 56 %; ₱ ton, $1.70 @ $1.90. The above prices for Ores delivered in Chattanooga on cars or on the wharf from flat-boats.

Nails.—The market continues depressed here on account of the rush of Ohio river Nails into every town along the lower Ohio and Mississippi, which are being pushed on the market at $2.15. We quote at $2.40, with usual discounts on large lots.

Manufactured Iron.—The demand for Merchant Bars is good, and the mills are kept busy on double turn. Prices rule firm. Bolts, Spikes, Fish Plate, and all smaller articles are in good demand at quotations: Bar we quote at $2; Railroad Spikes, $2.50; Light Rail, 2.25; Track Bolts, $3; Trestle Bolts, $4.

Iron Rails.—The mill here is still running on considerable jobs of rerolling. There is no market for new rails, except for steel, which are bought of Pennsylvania mills.

Coke.—No change. Supply ample and quotable at usual price, $2.50 ₱ ton on cars in Chattanooga.

Coal.—Is in light demand, and the supply being unusually full, prices tend downward. Chattanooga is next to Pittsburgh in the cheapness of fuel for manufacturing purposes. We quote run of mine at $1.50 @ $2 ₱ ton on cars in Chattanooga.

BOSTON.

MAY 21.—*Pig* is extremely depressed, and a cash buyer could probably obtain concessions from our quotations. We quote: $20.50 @ $21 for No. 1, $19 @ $19.50 for No. 2, and $18.50 @ $19.25 for Gray Forge. *Bar* continues quiet and steady, quoting $40 for Refined and $34 @ $35 for Bolt; American Rails, $32 @ $37; Steel Rails, $42 @ $43, from mill. Nails are in light demand at unchanged prices. Sheet is selling at 3¢ @ 3¼¢ ₱ lb. Russia is quiet at 10¾¢ @11¢. We quote English Spring Steel at 7¢ @ 8¢, gold; 9¢ @ 11¢ for German; 9¢ @ 11¢ for Machinery; 14¢ @ 15¢ for Cast; 10¢ @ 12¢ for Blister; 8¢ for American Spring; 13¼¢ @ 14¢ for Cast; 9¢ for Blister; and 8¢ for Machinery. Sales are reported of 4000 tons Steel Rails, fall delivery, on private terms, but there has been scarcely anything done in Iron Rails. The Bohemian, from Liverpool, brought 2295 Bars Iron, 275 bundles ditto, Thayer & Lincoln. The Marathon, from Liverpool, brought 7 cases and 8 plates Steel, H. B. Jackson; 10 cases and 2 bundles Steel, W. L. Richards; 491 bundles Coiled Rod Iron, American Screw Company; 181 bundles, 2 coils, 2 cases and 2 casks Steel, order. *Copper* is dull and unchanged, with prices still favoring the buyer. The few sales that have been made have been at 16½¢. Cable telegrams from England note a decline of £1 in Best Selected and 10/ in Chili Bars. The Bohemian, from Liverpool, brought 587 Yellow Metal Bolts, Thayer & Lincoln. For Manufactures we quote: New Sheathing, 28¢; Bolts and Braziers, 30¢; Yellow Metal Bolts, 25¢ @ 25½¢; do. Sheathing, 20¢. *Lead* is weak, with scarcely anything doing, but quotations unchanged. We quote: Pig, 3½¢, currency; Sheet, 6¢; Pipe, 6¢; Tin-Lined Pipe, 15¢; Bar Lead, 5½¢; all of these, excepting Pig, are subject to the usual trade or 10 % discount. *Antimony* is firm at 13¢ @ 13¼¢, gold, for Boston spot lots. *Spelter* is easy, closing at $5.12½ on the spot for 10-ton lots. *Tin* is very dull, but we leave our quotations unchanged. The Palestine, from Liverpool, brought 350 ingots Tin, 275 boxes Tin Plates, order. The Marathon, from Liverpool, brought 1316 boxes Tin Plates, order. We quote: Straits, 14⅜¢ @ 14½¢; Banca, 17¼¢ @ 17⅝¢; Refined English, 14¾¢ @ 15¢, gold. We quote Plates: Charcoal, I. C., $6 @ $6.25; Coke, $5.25 @ $5.50; and Terne, $5.50 @ $6, gold.—*Commercial Bulletin.*

ST. LOUIS.

Specially reported by Messrs. SPOONER & COLLINS, Iron Commission Merchants, 217 North Third street, St. Louis, under date of May 15: Our market has been moderately active the past week. Prices have remained unchanged, and present indications show a prospect for a fair trade during the coming season.

	No. 1.	No. 2.	Mill.	White and M't'l'd	
M'souri Stone Coal	$22.00	$20.00	$19.00	$16.00	
Missouri Charcoal	20.00	19.00	18.50	17.00	
Tenn. Charcoal	22.50	20.50	18.50	17.00	
South. Coke, soft and strong	23.00	21.00	19.00	Mottled. 18.00	White $18.00
Hang. Rock Charcoal	25.00	24.00	23.00	.....	
Hang. Rock Charcoal, Cold-short.	23.00	.....	.....	.....	
Hang. Rock Coke, equal to Scotch.	Extra No. 1 I. M. Ore. 25.00	No. 1 I. M. Ore. 24.00	Extra A No. 1 Native. 24.50	No. 1. Native. 23.50	Alloa, Am. Scotch 23.00
West Va. Coke	Extra No. 1. 23.50	No. 1. 23.00	B No. 1. 22.00	No. 2. 21.50	

COLD-BLAST CHARCOAL—All Numbers.

Hanging Rock	4 mos.	$25.00 @	38.00
Tennessee	4 mos.	26.00 @	30.00
Kentucky	4 mos.	26.00 @	30.00
Missouri	4 mos.	26.00 @	30.00
Georgia	4 mos.	26.00 @	30.00
Alabama	4 mos.	26.00 @	30.00
Assorted Bar Iron		2.00 @	2.10
No. 1 Railroad	₱ 100	.90 @	1.00
Heavy Cast Scrap	"	.65 @	....
Light " "	"	.55 @	....
Old Rails	4 mos.	20.00 @	20.50
Old Car Wheels	4 mos.	16.00 @	17.00

CINCINNATI.

Messrs. E. L. HARPER & Co. (successors to Messrs. L. R. HULL & Co.), under date of May 20, write us as follows: We have had a fair demand for Foundry and Mill Irons. Stocks generally, cannot be increasing, but at present the supply appears ample for all demand. Prices range about the same.

HOT-BLAST FOUNDRY.

Hanging Rock, No 1, Charcoal		$22.00 @	22.50
" No. 2, "		20.00 @	20.50
" No. 1 Coke		19.00 @	21.00
" No. 2 "		18.00 @	19.00
" No. 1, Stonecoal		18.00 @	19.00
Virginia, No. 1 Coke		19.00 @	20.00
" No. 2 "		19.00 @	19.50
Ala. and Tenn., No. 1 Charcoal		20.00 @	20.50
" No. 2 "		19.00 @	19.50
Shawnee, No. 1 Stonecoal		19.00 @	19.50
" No. 2 "		17.50 @	18.00

FORGE IRONS.

Hanging Rock No. 1 Charcoal		19.50 @	20.00
Hanging Rock No 1 Coke		18.00 @	18.50
Virginia, No. 1		18.00 @	18.50
Ala. and Tenn. No. 1 Charcoal		18.00 @	18.50
Red-short, No. 1 Coke		19.00 @	20.00
Cold-short, No. 1 Stonecoal		16.00 @	16.50
Old Rails, according to quality	cash,	19.00 @	20.00

CAR WHEEL AND MALLEABLE.

Hanging Rock		33.50 @	35.00
Southern and Western Brands		28.00 @	30.00

ORE.

Virginia Hematite (Washed)	cash,	4.25 ₱ .	..

BALTIMORE.

Mr. W. N. WYETH, Iron and Steel Merchant, 46 and 48 South Charles street, reports us the following prices, under date of May 20: There is no new feature to note in this market for the past week, the busi-

ness doing is chiefly confined to near wants, and at values close to quotation figures.

AMERICAN REFINED BAR IRONS.

1 to 6 wide by ⅜ to 1 thick.... / 1 to 4½ wide by 1½ to 2 thick. \	₩ ℔	1.95 @ 2 ¢
Round and Square, ordinary sizes from ¾ to 2 inclusive	"	1.95 @ 2 ¢
Hoop iron, 1½ wide and upward..	"	3 @ 3¼¢
Band Iron, from 1¼ to 4 in. wide..	"	2¾ @ 3 ¢
Horse-shoe Iron ¾ to 1 wide by ⅜ to ½ thick	"	3¼ @ 3½¢
Norway Nail Rods	"	5½ @ 6 ¢
Black Diamond Cast Steel, Flats, Squares and Octagon, ordinary sizes	"	14½ @ 15 ¢
Machinery Steel	"	8 @ 9 ¢
Cast Spring Steel	"	7½ @ 8 ¢
Homogeneous Steel Plate	"	8½ @ 9 ¢
Perkins' Horse shoes, ₩ keg of 100 lbs.		$3.37½
" Mule shoes		4.37½
R. R. Spikes		2¾¢ @ 2¾¢
Common Horse Nails	₩ ℔	14¢ @ 18 ¢

	10	9	8	7	6
Putnam Horse Nails....₩ ℔	18	19	20	21	23¢
Globe Horse Nails.....₩ ℔	18	19	20	21	23¢

Less list discount to the trade.

Messrs. R. C. HOFFMAN & Co., Iron and Commission Merchants, No. 23 South Frederick street, report the Pig Iron market as follows, under date of May 20: The Iron market continues dull and depressed, with light sales at about quotations, viz.:

Baltimore Charcoal Pig	$28.00 @ 29.00
Virginia " "	27.00 @ 29.00
Anthracite No. 1	19.00 @ 21.00
" No. 2	18.00 @ 19.00
" No. 3	17.00 @ 18.00
" Mottled and White	14.00 @ 15.00
Charcoal, C. B. Blooms	50.00 @ 52.00
" " Billets	52.00 @ 55.00
Refined Blooms	45.00 @ 50.00

RICHMOND.

Mr. ASA SNYDER, Iron Merchant and Furnace Agent, Richmond, Va., writes as follows under date of May 20: About 600 tons of Pig Iron have been received by consumers since last report. No Iron is held here on storage. The founders are generally stocked to the extent of their orders for work, and as no new orders are coming in to these establishments there will be but little demand for Pig Iron till business revives. We quote as below, although the market is weak.

Va. Cold-blast Charcoal, Cold-short		$20.00 @ 24.00
Va. " " Neutral		28.00 @ 29.00
Va. Warm-blast " Cold-short		19.00 @ 22.00
Anthracite, American Scotch		23.00 @ 24.00
" No. 1		19.50 @ 20.50
" No. 2		18.50 @ 19.50
" No. 3		17.50 @ 18.50
" Mottled		15.00 @ 15.50
Coke, (West Virginia) No. 1		21.00 @ .
" " No. 2		20.00 @ ....
Old Rails		16.00 @ 17.00
Wrought Scrap No. 1		18.00 @ 19.00
Cast " (machinery)		16.00 @ 17.00
Richmond Refined Bar Iron		2.00 @ 2 1-10
Horse Shoes per keg		4.50 @ 4.75
Mule " "		.... @ 5.75
Old Dominion Nails, Standard Size, ₩ keg		2.60 @

Freight to New York, $1.75; Philadelphia, $1.50, per ton of 2240 ℔.

LOUISVILLE.

Messrs. GEO. H. HULL & Co., under date of May 20, write us as follows: Fair demand for all grades, Foundry Irons taking the lead. While there is no change in quotations it seems to be the impression that bottom has been reached, and with an increased demand prices would show more firmness than they have manifested for a year. The usual time, 4 mos., is allowed on the quotations below:

FOUNDRY IRONS.

No. 1 Hanging Rock, Charcoal	$21.00 @ 22.00
No. 2 " "	18.00 @ 20.00
No. 1 Southern, Charcoal	18.50 @ 19.00
No. 2 " "	17.50 @ 18.00
No. 1 Hanging Rock, Stonecoal and Coke	19.00 @ 20.00
No. 2 Hanging Rock, Stonecoal and Coke	18.00 @ 19.00
No. 1 Southern, Stonecoal and Coke	18.00 @ 19.00
No. 2 " "	17.00 @ 18.00
"American Scotch"	19.00 @ 20.00
Silver Gray	16.00 @ 17.50

MILL IRONS.

No. 1 Charcoal, Cold-short and Neut'l.	16.00 @ 17.00
No. 1 Stonecoal and Coke, Cold-short and Neutral	16.00 @ 16.50
No. 2 Stonecoal and Coke, Cold-short and Neutral	@ 16.00
No. 1 Missouri and Indiana Red-short.	20.00 @ 21.00
White and Mottled, Cold-short and Neutral	14.00 @ 15.00

CAR WHEEL AND MALLEABLE IRONS.

Hanging Rock, Cold-blast	32.00 @ 34.00
Alabama and Georgia, Cold-blast	25.00 @ 31.00
Kentucky, Cold-blast	25.00 @ 30.00

Messrs. W. B. BELKNAP & Co., Iron and Steel Merchants, Louisville, Ky., under date of May 20, report: Continued rain and cold have depressed hopes of extraordinary crops, and trade sympathizes. In some neighboring localities cattle have been turned in on rusty wheat, and in others it has been plowed under. Prices are unsatisfactory all around. If a manufacturer makes concessions in a special emergency the advantage is immediately given away by the jobber to his customers, which in turn reacts on the market everywhere. It is the natural result of lack of confidence. There is a little better demand for Carriage Hardware, which has been unprecedentedly dull since February. Shelf hardware men are complaining, the usually seasonable fly-trap hanging heavy on their hands. Iron, Horse Shoes and Nails are bought where actually needed without much hesitation on account of the very low prices ruling. The failure of a prominent firm in Northwestern Georgia, largely interested in furnaces, has excited some comment as evidence of the unremunerativeness of Iron Plates even in that cheap producing section.

FOREIGN.

FRANCE.

(*Moniteur des Interets Materiew.*)

PARIS, May 5, 1878.—*Metals.*—The inauguration of the great international show, the arrival of correspondents, &c., has compelled both merchants and manufacturers to neglect their ordinary business pursuits, hence the Paris markets offer for the week no new features in the metal branch. The feeling is, however, one of greater firmness and confidence; but for the uncertainties still attaching to general European politics, we should now be on the eve of a great revival. *Copper.*—The statistical position of this metal still remains an unfavorable one, the visible supply in England and France being nearly 47,000 tons. The demand for consumption does not keep pace with increasing stocks, being in a measure held in check by the doubtful aspect of European affairs. We quote to-day, deliverable at Havre, Chili Bars, 170 francs the 100 kilos.; Common ditto, 165; Ingots, 170; Tough Cake, 173.75; Best Selected, 175; and pure Corocoro Ore, 175. Havre is quiet and quotes first brands Chili Bars, 165 @ 166.25; good current ditto, 162.50; and Lota and Urmeneta, 161.25. Paris conditions. Marseilles is steady; they quote Spanish in slabs, 157.50; Red Tokat, 160 @ 165; small Refined Ingots, 175: Bolts, 195; Sheathing, 190, and Yellow Metal ditto, 190. *Tin.*—The visible supply in England and Holland continues on the increase, notwithstanding the steady deliveries, being 18,000 tons, against 16,500 May 1, 1877, and 14,700 May 1, 1876, a discouraging feature, carrying down the price of Straits at London to £61 against £69 May 1, 1877, and £72 May 1, 1876. The Paris market has been weak. We quote Banca, deliverable at Havre, or Paris, 180; Billiton, 171; Straits, 170; Australian, 167.50, and English at Havre or Rouen, 167.50 francs the 100 kilos. Marseilles is flat at: Straits, 165; Billiton, 170; English Refined, 180, and Banca, 177.50. *Lead.*—Notwithstanding the diminished output in Spain the tendency in England and France remains a downward one, and consumers are holding aloof in hopes of buying cheaper after awhile. We have dropped to low figures here, say, 42 @ 43 francs the 100 kilos. Havre quotes: Spanish, 43 @ 44. Soft, at Marseilles, can now be had at 40 @ 41, and Manufactured at 47. *Spelter.*—The stock in England is accumulating, exceeding 1800 tons; this being the case we are tending toward lower figures again. The quotation here is 47.50 @ 48.50 the 100 kilos. Sheet Zinc has declined to 60 @ 62 francs at Marseilles, and Old Remelted to 43. *Iron.*—The position here has been reversed, and we are now breaking down under the load suddenly accumulated. Merchant Iron has given way to 160 @ 170 francs. Producers in the Haute-Marne have met the altered state of affairs resolutely, and accepted lower prices. In the Loire basin the railroad companies have made some purchases of note. In the Meurthe and Moselle Pig Iron is sustained, although the demand is less active. At the North the decline is now fully established, and Merchant Iron is selling at 150 @ 157 francs. Some important orders have been sent there from here since the decline.

BELGIUM.

(*Revue Universelle*)

BRUSSELS, May 5, 1878.—*Iron.*—The situation here is less favorable than it has been of late, and sales of Merchant Iron have been made at 115 francs. In great quantities "moulage" Pig Iron of English make is selling at 6.85 @ 6.90 francs the 100 kilos., delivered at the Belgian Iron Works, much to the annoyance of our blast-furnace owners. The import into Belgium of Iron Ore and Scrap during the first quarter of the year has been 199,000 tons, against 151,000 in 1877 and 165,000 in 1876; Pig Iron, 60,000 tons, against 52,000 and 57,000; Manufactured, 3161, against 3476 and 3166; export of Ore and Scrap, 67,000, against 37,000 and 33,000; of Pig, 1627, against 3000 and 3500; Manufactured, 41,000, against 44,000 and 38,119. Various adjudications for railroad material for the State lines will come off during the current month, the government moreover purposing to build a belt railroad around our city. Our manufacturers continue to compete vigorously with those of England in various parts of Great Britain in return for English Pig Iron competition in Belgium.

GERMANY.

(*Borsenhalle*).

HAMBURGH, May 4, 1878.—*Metals.*—From a commercial point of view the general outlook is rather an encouraging one in Central Europe. Crop prospects are thus far encouraging, money is easy, there has been no overtrading, and business would become quite brisk but for the doubts still overshadowing the political aspect. Stocks of metals are not large in Germany, but the continual decline in England and elsewhere causes consumers and dealers not to anticipate requirements. *Copper* inspires little or no confidence. The following are the quotations: At Berlin, English and Australian, 71.50 @ 76.50 marks the 50 kilos.; Refined Mansfield, 76.50 @ 77; here Drontheim, 75 @ 76; Lake, 86; English, 69.50 @ 70; English Sheathing, 80.50 @ 81; Yellow Metal, 65 @ 66; at Stettin, all sorts, 80. *Tin.*—Great weakness everywhere in Germany. Berlin quotes Banca, 71.50 @ 72 marks the 50 kilos.; English, 68.50 @ 69; we quote here, Banca, 74 @ 75. Stettin quotes all sorts 76 @ 77. *Lead* still tends downward. Berlin quotes Tarnowitz, Hartz and Saxonian, 17 @ 17.25 marks the 50 kilos. We quote here, English Pig, 20 @ 21; ditto Sheet, 21.50 @ 22; German Pig, 19.50 @ 20; Spanish, 19.50 @ 21.50; English and Dutch White Lead, 31.25 @ 34.50. Stettin quotes Spanish, 25 @ 26; Tarnowitz and German, 21 @ 22. *Spelter* has resumed a downward tendency. We quote our own market as follows: Silesian, to arrive, 20 marks the 50 kilos.; ditto, Sheet Zinc, 24.50 @ 25; Vieille Montagne ditto, 25 @ 25.70; ditto Sheathing for vessels, 26.30; Zinc White, 26 @ 28; Light Gray ditto, 25.50; Dark, 29.50. Berlin quotes Silesian Spelter, 18.75 @ 19.20; Breslau quotes, 17.40 @ 17.50, to arrive; W. H., on the spot, 17.50; Godalla, 17.60. The quotation at Stettin is 21 @ 21.50.

HOLLAND.

(*Koch & Viierboom.*)

ROTTERDAM, May 7, 1878.—*Tin.*—The following are the official government returns:

EXPORT OF TIN FROM HOLLAND.

	February			Two mos.		
	1878.	1877.	1876.	1878.	1877.	1876.
Germany...Tons.	221	306	335	431	543	506
England	16	32	1	16	51	8
Belgium	130	150	173	240	351	252
France	19	34	39	34	87	49
Hamburg	76	56	60	122	81	83
United States	..	9	13	..	36	15
Other countries	9	7	3	14	11	6
Total	471	603	624	857	1,160	919

The market is dull; Banca sold at 38.50 @ 39.25 guilders the 50 kilos, to arrive, and closes on the spot at 39; Billiton sold at 36.50. Stock on warrants in government hands, 52,808 slabs Banca and 700 Billiton, against 56,261 and 5484 last year at same period; deliveries during the quarter, 26,323 slabs Banca and 2864 Billiton, against 30,371 and 2010 in 1877; April deliveries, 13,671 Banca and no Billiton, against 17,318 Banca and no Billiton in 1877. Total during 4 months, 39,994 Banca and 2864 Billiton, against 47,689 Banca and 2010 Billiton in 1877. Afloat from Banca on board sailing vessels, 7000 piculs, against same time last year 1175 piculs. Deliveries of Billiton from private hands in April, 8807 slabs; since January 1, 29,344; stock, 55,437 slabs.

CHINA.

(*Arnold, Karberg & Co.*)

CANTON, April 10, 1878.—*Coal.*—Considerable activity has existed in this market during the greater part of the past fortnight, and a large business has been transacted in floating cargoes at gradually hardening prices. The demand has been chiefly speculative, based upon the apprehensions of immediate war between England and Russia. Sixteen cargoes have changed hands to arrive, mostly Australian, aggregating 17,726 tons, at $8.50 @ $9.50 per ton. At the close a much quieter tone prevails. Buyers have mostly withdrawn from the market and prices are barely supported. There are now afloat 16,475 tons Australian, 20,739 tons Cardiff and 1165 tons Liverpool.

EAST INDIES.

(*J. Peet & Co.*)

BATAVIA, Java, March 28, 1878.—*Tin.*—On the 8th prox. 10,000 tons Billiton will be sold by public auction. The average realized for a similar quantity at the February sale was 41.61 guilders per picul. *Coal.*—Of a cargo of West Hartley sailing per Europa, 600 tons have been sold at 23 guilders and 800 tons at 21 per ton, cash, from alongside, deliverable at Cheribon. We hear that a local firm has entered into a contract to supply the government with 15,000 tons English Coal for the Batavia Harbor Works at 22 guilders per ton.

(*Gilfillan, Wood & Co.*)

SINGAPORE, April 10, 1878.—*Tin.*—Supplies continue on a very moderate scale, but owing to the dull state of the London market, the price has given way, and closes weak at $18.25 per picul. Shipments from the Straits settlements to the United States during the first quarter 19,411 piculs, against 12,698 in 1877; 10,198 in 1876; 20,097 in 1875; 12,071 in 1874; 8255 in 1873; 15,904 in 1872; 11,863 in 1871, and 5693 in 1870. *Tonnage.*—The supply of disengaged vessels is less abundant, and rates to the United Kingdom have advanced to 27/6 for dead weight to London, and 32/6 @ 35/ to Liverpool. For New York the Wakefield and Hawthorn have taken the berth at 25/ for dead weight, but neither has anything like full cargoes engaged. The Star of the East sails to-day without any Tin, for New York, while the Speculant sailed for Boston with 1627 piculs, leaving the berth vacant. *Exchange* has declined to 3/11⅞ @ 4/1, 6 months' sight, London.

Our English Letter.

Review of the British Iron, Steel, Metal and Hardware Trades.

(*From our Regular Correspondent.*)

LONDON, ENG., May 7, 1878.

THE PARIS EXHIBITION

opening has been the leading feature of the past week, and has not only attracted preponderating attention, but has also drawn a very large number of visitors from this and other great European centers. It would, of course, be entirely superfluous on my part to pretend to give you any description of the opening ceremonial or of the great variety of exhibits, but you will, probably, allow me to say that such of us as happened to be present have unanimously come to the conclusion that they do not manage these things better in France. Everything save the British agricultural department was in a higgledy-piggledy state when the gates were thrown open to the public, and the whole of the arrangements were absolutely disregarded in getting through the programme of the day. In spite of these very palpable defects, however, the show is likely to prove an ultimate success, and its actual accomplishment in the face of so many difficulties is a matter of which France as a nation has reason to be proud.

THE COMPARATIVE MERITS

of the different nationalities as regards the exhibits from that point of view can hardly as yet be definitively spoken about. From what can already be seen, however, Great Britain seems to retain its old place as the head and forefront of metallurgical and mechanical articles, as well as in saddlery and the like, while the United States are well to the fore in respect of agricultural appliances and certain classes of tools, France in fine art metal work, ornamental arts; Belgium in *quincaillerie* and rolled iron, and some of our colonies in other kinds of metal working.

AT HOME

the demon suspense still has us at its mercy, and we chafe under the miserable uncertainty that exists as to the probabilities of, or against, war. Few people now flatter themselves that we can escape a conflict with Russia, and fewer still are those who would prefer to allow that power to tear up treaties with impunity. John Bull has got "his back up" this time, and there can be but little doubt that in doing as they are the government have an enormous majority behind them. Just now

THE PRIVATEERING SCHEME,

which appears to have been suddenly mapped out by the Czar's advisers, is attracting considerable attention, chiefly owing to the telegrams from your side of the Atlantic in relation to the Cimbria and other mysterious strangers. It is certainly curious that such a course of procedure should be seriously spoken of in "these enlightened (?) days;" but it is an undeniable fact that the commerce of Great Britain would for a time be most critically affected by its operation. I say "for a time" because I am of opinion that there is no nation at present sufficiently powerful to sweep the British merchant flag off the seas. Some months ago, in foreshadowing this subject, I gave a number of interesting particulars relative to the Peninsular and Oriental Navigation Company, in the course of which I stated that all the 50 or 60 powerful vessels of that company could at 24 hours' notice issue forth as armed cruisers on Her Majesty's behalf. Similar arrangements exist with some of the principal Atlantic companies, and with the owners of all the chief ocean-going lines. To utilize these vast and intricate organizations would be a bold project, but it might be done at a critical juncture, and, indeed, may come to pass shortly, for there are persons who say

THAT A GREAT CONSPIRACY

has been entered into against the commercial and naval supremacy of this country, with the object of hurling down the British lion from his present supreme position, "cutting up" the colonial empire in "eligible lots for disposal to the highest bidder," and for so arranging tariffs as to ruin all the British manufacturers. Such a gigantic plot is, to put it mildly, rather visionary and equally impracticable, for the experience of recent years, as well as of the far-away past, plainly demonstrates that there can be no efficient and lasting unions of nations, and that, therefore, one powerful and determined power can always defy the threat of combinations, provided it is wealthy and is early in the field. I give the idea just detailed for what it is worth, merely adding that imaginative minds might readily find plenty of circumstantial evidence in support of it.

THE CURRENT REPORTS

of the average condition of the iron trade and its allied industries throughout the country are not more hopeful, on the whole, than heretofore, for it is quite clear that the question of continued stagnation or early improvement must be considered as being matters to be determined by the issue of war or peace. For this reason there is beginning to be a good deal of real anxiety—not previously felt—as to the immediate future, seeing that freights for long voyages have been put up in a marked degree during the past few days in London and elsewhere—not to mention the significant circumstance that at Rotterdam and other Continental ports merchants are declining to place consignments over the sea under *the British flag*. This is really alarming, at last.

SCOTCH PIG IRON

has been flat all the week, and warrants are now lower than for some years past. There are now 173,797 tons in Connal's stores—an increase of 1435 tons since my last, and nearly 41,600 tons more than same date last year. The total coastwise shipments this year have been 124,262 tons, and foreign 136,927 tons—a decrease of 12,465 tons in 1878.

Messrs. James Watson & Co., Glasgow, report as under: "Our market for Scotch Pig Iron continues flat. On Monday business was done in Warrants at 50/1 cash, and gradually advanced till 50/3 was paid on Wednesday. Since then the price has receded until 49/10 cash was accepted this afternoon, at which price we close sellers, buyers offering 49/9. Shipments last week were 8382 tons, against 13,390 tons in the corresponding week of 1877." We quote:

	No. 1.	No. 3.
G. M. B., at Glasgow	50/6	49/6
Gartsherrie, "	57/6	53/
Coltness, "	62/	54/6
Summerlee, "	57/6	51/6
Langloan, "	59/	52/6
Carnbroe, "	52/6	50/6
Calder, at Port Dundas	56/6	50/
Glengarnock, at Ardrossan	56/6	52/
Eglinton, "	51/6	50/
Dalmellington, "	51/6	50/6
Shotts, at Leith	59/	55/6
Kinneil, at Bo'ness		51/

John E. Swan & Bro.'s, Limited, and William Colvin & Co.'s figures are almost identical with these.

Last week's shipments from the Clyde ports comprised. "New Zealand: 251½ tons iron castings, £3489; 3 tons wrought iron nails, £178; machinery, £1448; 4¼ tons unenumerated iron manufactures, £300; 4 locomotive engines and parts, £13,000; 6¼ tons wrought iron tubes, £107; 97½ tons wrought iron railway materials, £1727; 12¾ tons bar iron, £115. Taganrog: 398 tons iron castings, £1850. Rouen: sewing machines, £2486; machinery, £3488; 8¼ tons wrought iron, £160; 7½ tons iron castings, £79; 4¼ tons galvanized iron, £90. Melbourne: 75½ tons iron castings, £506; 16¾ tons galvanized iron tubes, £313; 25 tons wrought iron plates, £200; 11½ tons wrought iron tubes, £163; 4¾ tons wrought iron, £40; 6 tons wrought iron rivets, £60; sewing machines, £2200; machinery, £321. Sydney: 36½ tons wrought iron tubes, £600; 162¼ tons iron castings, £1203; 24¾ tons wrought iron rivets, £140; 44¾ tons bar iron, £304; machinery, £191; 29¼ tons angle iron, £178; two anchors, £45; 4¼ tons sheet iron, £38; 1¾ tons galvanized iron tubes, £31. Charlottetown (P. E. I.): Unenumerated iron manufactures, £10. Bordeaux: Sewing machines, £151; 10½ tons wrought iron, £210. Valparaiso: Steam boilers and filters, £699; machinery, £18; 9 tons iron castings, £84; unenumerated iron manufactures, £44. Bombay: 777¾ tons iron castings, £4529; sewing machines, £140; 10 locomotive engines, £16,575; angle iron, £40; iron and steel manufactures, £95. Havre: 1¾ tons wrought iron, £35; machinery, £100."

THE NORTH OF ENGLAND

is, on the whole, pretty fairly engaged. The smelters are doing what we must reasonably take to be a fair amount of business, seeing that last week's shipments reached 13,480 tons. If our producers of manufactured iron could do as well as the pig iron smelters we might be comforted on the subject of foreign competition, for it is reported from Brussels and other parts of Belgium, that the Middlesboro' pig can be delivered and sold there at less money than the products of the native furnaces. But then the Belgians have their revenge, and inundate our markets with wire, nail rods and various classes of merchant iron, which they offer at prices which our venders cannot touch?

THE TRADES OF SHEFFIELD

are in the main unchanged, the previously reported quietude being still dominant over all the chief industries of the town and district. The one exception to this rule is the Bessemer rail trade, to which I have of late somewhat frequently made allusions. The whole of the local mills in this branch, with two exceptions, are well engaged, and three of the firms, or rather companies, have orders on their books sufficient to keep the machinery in operation for about another five or six months. Steel, Tozer & Hampton are running on contracts from the Great Northern, Great Eastern and London and Brighton lines; Wilson & Cammells on Great Northern, Midland, and other home orders; and Brown, Bayley & Dixon on Russian government commissions, as well as a good Midland lot. I believe W. C. B. Holland, of the last-named firm, is now on the Continent, engaged in a keen hunt after one of the best specifications offered for some time past. At John Brown & Co.'s, the rail mill, a splendid structure, mostly stands idle, and the company take no orders for rails except at their own price. Charles Cammell & Co. have a Russian order on hand, besides some few have commissions. At Samuel Fox & Co.'s work is intermittent in the rail mills, but one good commission, at least, has been secured lately. In all competitive cases steel rails are offered appreciably under £6 per ton. The cast-steel trade is very quiet in the general run of business, and I should suppose it to be exceedingly questionable whether even good firms are clearing 10% on their turnover. One manufacturer of 35 years standing told me the other day that he really could not bear this Bessemer competition any longer, and thought he should entirely give up the production of low grades of cast steel. For soft Siemen's material there is a fairly good sale, especially for certain classes of wire and sheets or plates where ductility is an object. In the cutlery branches there is a very encouraging amount of work in hand, much of it being for your Southern and Western states, (as regards razors, fine pocket, and best table cutlery,) and an increasing traffic in large knives, cane cutters, bowies, butchers, &c., with our Australasian colonies, the West Indies and the West Coast of Africa. One marked result of the recent newspaper discussions as to the alleged bad packing of British exporters is forthcoming in the shape of much extra care in that respect at Sheffield.

THE TIN-PLATE WORKERS

Company, of London, are about to hold a very interesting exhibition at the Crystal Palace of the work of artisans only. They will give some hundreds of pounds in prizes, have already nearly 150 entries and expect to have their "little show" opened by Royalty, and "wound up" by a dinner.

FROM BIRMINGHAM

our current reports are neither ample nor reassuring, the course of trade being everywhere of the merest routine nature. Best marked iron is still quoted at the nominal price of £8. 10/, but, as I have so often stated, only two or three houses rigidly adhere to this margin, all the others being glad enough to obtain orders as best they can. There is still, nevertheless, a good call for dockyard iron and boiler plates, and at least two houses have large contracts on their books for bridge and girder iron. Most of the Birmingham and district hardware industries are fairly even if not fully engaged. In all branches competition is keen, and there is a good deal of very quiet but extensive shading of prices in the shape of offers of large discounts for special orders. The

ENGLISH AND AMERICAN TUBE QUESTION

is further discussed in this week's *Ironmonger* by Mr. George Westinghouse, Jr., of pneumatic brake celebrity, who has at length gone to the root of the controversy by giving *net* prices in both instances. Mr. Westinghouse is again rather hard on the poor Britishers—if I may so commiserate them—and declares that he could not be induced to use ordinary English gas pipe (for his brakes) if the discount were 95 per cent. A comparison of what are thus given as *net* prices certainly seems favorable to your makers of these articles. Immediately following the letter just mentioned the editor of the *Ironmonger* places an article quoted from the San Francisco *Journal of Commerce* in which it is stated that a numercusly signed petition has been sent to Congress in favor of a repeal of the duty on such goods. In the same paper

AMERICAN HINGES

are defended by Markt & Co., who, while admitting that Mr. Clark's condemnation (mentioned by me last week) is true to some extent, deny that American hinges in general are so badly made as had been stated.

SOUTH WALES AND MONMOUTHSHIRE

are quiet in respect of iron, albeit the coal shipments are again on an extensive scale, especially to the Mediterranean ports. Of the iron 300 tons of rails went from Rhymney to Garnbely, 100 tons bars to Oporto by Dowlais, and 30 tons of tin plates to Oporton by Dowlais. From New Port 3060 tons of iron and steel were exported, and 5306 tons of ore were brought into that port. The tin plate trade continues fairly active, but it is reported that the "restriction" movement has not yet developed into a practical measure of success.

THE METAL MARKETS

have been dull and lower in tone all round. The *Ironmonger* reports: "*Copper* has been dull throughout. G. O. B. Chili bars are now £61. 15/ to £62/. A lot of 50 tons Urmeneta sold at £62. No change in Australian. Shipments from Valparaiso during the first fortnight of April were 800 tons, of which 400 for Continent and 400 for United Kingdom. At Swansea, on April 30, 1915 tons copper ores, average 7 7-16ths, equal to 142 tons fine copper, realized an average of 10/7¾ per unit of produce and £7579 gross value. The stocks of copper now held in London are: Australian, 2911 tons; Chillian, 49; foreign, 33; and British, 50; total, 3043 tons, against 1656 tons same date last year. *Tin* has been somewhat irregular. Sales of Straits and Australian have been made at £60. 10/ @ £61, spot, and English ingots £65 @ £65. 10/. The stock of this metal in London on April 30 was 9231 tons, as compared with 8848 on March 31, the deliveries during the month having been 1174 tons, and the arrivals 1557 tons. The total deliveries at Rotterdam by the Dutch Trading Company during April has been 13,671 slabs of Banca—a total of 26,323 slabs for the first quarter of the year. The stock there on warrants April 30 was 36,601 Banca and 400 Billiton; the new stock unsold with the Company, 16,207 Banca and 300 Billiton, or a total in first and second hands of 52,808 Banca and 700 Billiton, exclusive of about 7000 afloat. The stock of Billiton in Amsterdam and Rotterdam on April 30 was 55,437 slabs. Tin plates are in fair request, and venders seem disposed to hold out steadily for the rise of 6d. per box mentioned last week. It is reported that the "restriction" arrangement is hardly likely to be carried out. *Lead* unchanged at £17 @ £17. 2/6 for English pig, and £16. 12/6 @ £16. 17/6 for soft Spanish without silver. *Spelter* unaltered at last week's figures. The stocks of this metal on April 30 were: London, 184 tons; Hull, 1333 tons; and Grimsby, 315 tons. *Zinc* steady at late rates. At Messrs. Sargent & Son's fortnightly sales, May 2, 30 tons sold at £20. 15/, 10 tons at £20. 17/6, and 75 tons at £21. *Quicksilver*, £7 per bottle, with slow business. *Antimony*, £49 @ £50 for English."

The official report of the London Metal Exchange is: "*Copper.*—The charters from Chili for the second half of April are telegraphed as 1800 tons, viz.: 1500 tons bars and ingots for U. K. and 300 tons bars for the Continent. Small transactions in G.O.B. Chili bars at £61. 10/ @ £61. 15/, spot, and Urmeneta at £62; Wallaroo quoted at £72, and Burra, £70. 15/; English tough, £67 @ £68; best selected, £68. 10/ @ £69. 10/; strong sheets, £73. *Tin.*—A limited business at £60. 15 @ £60. 10/ for spot and forward. English ingots, £65 @ £65. 10/. *Iron.*—Scotch pig, 49/10½, cash. *Lead.*—English pig, £16. 17/6 @ £17. 2/6; soft Spanish, without silver, £16. 12 6. *Spelter*, £17. 15/ @ £18 for ordinary brands. *Quicksilver*, £7. *Antimony*, £49 @ £50 for English star.

An improved form of the well-known Clermond battery consists of an alloy of two parts of antimony and one of zinc as the negative metal, and ordinary tinned sheet iron as the positive element—the current at the heated junction flowing from the iron to the alloy. This alloy is cast in the form of a flat bar, broader in the middle than at the ends, and measuring from two to two and three-fourths inches in length by three-eighths to one inch in thickness. The sheet iron, properly stamped out, is placed in a mold into which the melted alloy is poured; before the alloy has cooled, the mold is opened and the bars are removed. This alloy melts at 500° F., and expands considerably on cooling. It improves on recasting, but is always very brittle. The bars are arranged radically around a temporary brass cylinder, a thin slip of mica being inserted between the iron and the alloy to prevent contact except at the point of junction. Eight or ten of these bars form a ring, and the several rings are placed one above another, insulated from each other by a circle of asbestos. The inner ends of the bars are heated by a Bunsen burner, the flame issuing in small jets in the annular space between the burner and the bars. The consumption of gas is said to be one cubic foot for each volt of tension per hour; and the electro-motive force of this combination is such that twenty elements are about equal to one Daniell cell—about one volt.

How the Yale Locks are Made.

The successful application of small flat keys made of sheet metal to locks adapted for ordinary use originated with the late Linus Yale, Jr., some 14 years ago, and marks an era in the art of the locksmith. The success of his invention has practically revolutionized the manufacture of locks in the United States, and there is no large manufacturer of locks at the present time whose work has not to a greater or less extent been modified by reason of the influence of Yale's invention upon the market.

Through the courtesy of the Yale Lock Mfg. Co., of Stamford, Conn., we have been enabled to prepare the following account of the methods employed in their manufacture, which we believe will be found of general interest to our readers. The earlier inventions of the late Linus Yale, Jr., related chiefly to bank locks, of which he was the inventor and maker of several kinds, each in its day holding the front rank in the American market for locks of this class. About 1860 Mr. Yale turned his attention to improvements in the locks for ordinary use, and between that date and 1865 invented, perfected and began the manufacture of the class of locks with which his name has now become identified, viz., the Yale pin lock, the key of which is represented in Fig. 1.

Fig. 1.

The distinctive peculiarities of the Yale lock may be classified as follows:

THE THIN, SMALL, FLAT KEY.

The keys previously in use were almost all of large, clumsy, uncouth forms. Each was of necessity provided with a round portion, the bearing on which it turned when in the lock. Yale detached this cylindrical bearing and made it a permanent fixture within the lock, and was thereby enabled to reduce the portable portion of its key to its simplest possible form, viz., a thin, flat plate of sheet metal.

THE ADJUSTABLE ESCUTCHEON, OR TUMBLER CASE.

This, as shown in Fig. 2, is a small shell

Fig. 2.

or case, usually of cylindrical form, within which is contained all of the tumblers or mechanism directly controlled by the key, and constituting the security of the lock against picking. The bolt and other mechanism of the lock are contained within a separate case of the usual form, and provision is made for uniting this case with the escutcheon so that the lock can be readily adjusted to either right or left hand doors and to doors of varying thicknesses. The most noticeable result of this arrangement is that, as the mechanism upon which the key acts is contained in the escutcheon (which

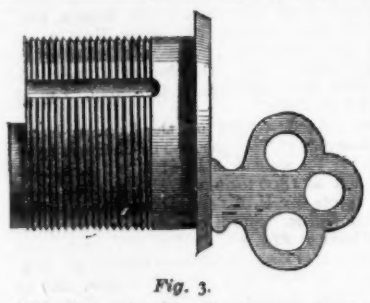

Fig. 3.

latter is always let into the face or front of the door), the length of the key remains constant no matter what the thickness of the door. In the old form of locks the thicker the door the longer the key had to be. In the Yale lock, on the contrary, the adjustment is made when the lock is first applied, and the connection for reaching the lock through the thickness of a heavy door is made a permanent part of the lock itself, instead of having to be carried in the pocket of the user, as is the case with the old forms of locks.

SECURITY AND NON-INTERCHANGEABILITY OF KEYS.

In the older forms of locks, and even in most of those now in common use, a few dozen, or, at the very most, one or two hundred, permutations is the extreme number of which the system admits, and thus, as the locks are made in great quantities, the same

Fig. 4.

keys are unavoidably reproduced again and again, and the protection afforded by the locks they control is proportionately diminished. The construction of the Yale lock, on the contrary, is such as to admit of 10,000, 20,000, and even 50,000 permutations (or varieties of key), according to the number of pins or tumblers used, as will be readily understood from Figs. 4 and 5, showing end view and cross section of the interior of the escutcheon of a Yale mortise night latch.

It will be seen that the key when in the lock acts upon a series of pins or tumblers contained in corresponding recesses within the escutcheon. In each of these recesses are two pins or tumblers, and a light spring pressing them downward. When the key is out of the lock, the upper pin in each chamber falls so as to intersect the joint be-

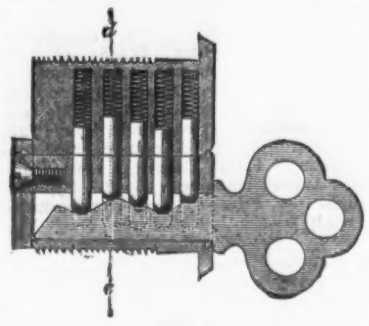

Fig. 5.

tween the "plug" (or cylinder which supports the key and turns with it in its revolution) and the surrounding metal of the escutcheon. The rotation of the key-cylinder or "plug" (which is necessary to effect the unlocking of the lock) is thus prevented. The insertion of the true key raises all of these pins or tumblers simultaneously, so that the joint between the two pins in each chamber corresponds with the joint between the plug and the escutcheon. The "plug" is thus left free to be rotated by the key, carrying with it the tumblers which rest upon the key, and leaving within the other respective chambers the upper or second series of tumblers, which directly prevent unlocking when the key is withdrawn. It is obvious that before the lock can be operated all of the tumblers must be simultaneously set to exactly the right hight. If any of them is raised too high, or not high enough, the rotation of the "plug" is effectually barred. As a variation of 1-50th of an inch in the hight to which any one of the pins of the lock is raised is sufficient to interfere with the working of the lock, it can be readily seen that this construction gives an immense capacity for permutation. If ten changes can be made upon each pin or tumbler, a lock with two pins can have 100 permutations, one with three pins 1000, one with four pins 10,000, and so on.

The present corporation was organized in 1868, when the works at Stamford, Conn., were commenced and a portion of their present buildings erected. Since then additions to the buildings have been made almost yearly, so that the works now afford the most complete facilities for the various manufactures in which the company is engaged.

THE BRASS FOUNDRY.

The company's manufactures are of a class in which brass and bronze are very largely used. Their foundry, therefore, is organized so that they are enabled to produce work of this kind of a high grade of excellence. Foundry processes, however, are so generally well known as to make it unnecessary to go into details here, except so far as to say that machine molding is employed on certain kinds of work, and that numerous appliances have been devised for improving the quality of the work or lessening the labor incident to its production. Among the latter is a magnetic machine, driven by a belt, for removing from the brass chips and turnings produced in the process of manufacture the particles of iron and steel which unavoidably become mixed with them. The chips or turnings are thrown into a hopper in the machine, from which they are automatically fed into a chamber where they are brought into contact with a series of magnets which attract the iron and steel and separate it from the brass. The cleaned brass falls from this chamber into a tray below, from which it can be removed, while the iron and steel are carefully brushed from the magnets and collected in a separate receptacle.

The brass furnaces, 16 in number, are contained in a pit with underground flues surrounding them, so that the radiation of heat is largely prevented—a matter of much consequence to the workman in summer weather. At one end of the foundry is a fire-proof vault with iron shelves and racks, within which is contained all of the company's very numerous and valuable patterns.

PROCESSES OF MANUFACTURE.

The first operation to which the castings for almost all kinds of locks are subjected is milling or edging. Most of this work is done in compound edging machines. The work is placed in a "holder" specially made to receive it, and is then acted on by mills or cutters revolving at a high rate of speed, which, moved by the workman and guided by hardened steel templets or formers corresponding in dimensions and contour to the exact size and form required for the work, reduce the castings accurately to the required dimensions, and simultaneously dress off all of its surfaces which are to be ultimately finished or which are used as guides or bearings for any of the moving parts of the lock. With pieces of intricate construction several milling or edging operations of this kind are required to complete the work, but in most cases it is completed before the piece or casting leaves the machine.

The next operation is that of drilling. The peculiar construction of the Yale lock, as shown in the illustrations already given, involves the drilling of a number of holes to receive the pins or tumblers of the lock. In addition to these are required the ordinary screw-holes for uniting the several parts of the lock and for attaching the lock to the door. The drilling of the pin-holes or tumbler recesses is done in small, high speed drill-presses by a drill of peculiar form, the cutting action of which is so quick that a person watching the workman's movements of the lever of the drill-press would imagine the process to be one of punching rather than drilling. The location of these pin-holes relatively to each other and to the other parts of the lock is a matter of extreme nicety, and upon the accuracy with which they are made depends in a great measure the smooth working of the lock. The piece to be drilled is placed in a steel "jig," or holder, which clamps it firmly, and which is provided with a series of hardened steel bushings, through which the drill is inserted, and which accurately guide the drill and determine the exact position of each hole. So accurately made are these tools, and so perfectly do they do their work, that upon sawing open an "escutcheon" and the "plug" or key-cylinder contained within it so as to uncover both ends of the pin chambers, a series of steel rods or pins accurately filling each of the several pin-chambers or holes may be inserted or passed through all of the holes simultaneously. The accuracy which this implies will be appreciated upon remembering that the "escutcheon" and "plug" are of necessity each made independently of the other, and each contains five or more of the pin-chambers or holes. An error or inaccuracy of a mere fraction of 1-100th part of an inch would prevent the proper registering of these two parts one with the other when they are assembled, without which the proper working of the lock is impossible. In drilling the screw and other holes in the locks, drill-presses with two, three and four spindles, each carrying a drill of different size, are used. For this work also the castings are held in suitable "jigs" which accurately determine the location and size of each hole. The use of drill-presses with several spindles permits the use of drills of various sizes, and thus enables all of the holes to be drilled at one operation.

Many other machine processes are carried on in this department in the production of the many details and parts required in the various classes of locks manufactured. Some of these processes are effected in the milling, edging and drilling machines already described, by means of special fixtures and appliances. Others are effected by other machines, such as screw machines, sawing machines, lathes, presses, &c. Nearly every process, even if done by machines of ordinary construction, involves the use of special contrivances which have been devised and made by the company for its own use. It is by means of these special tools and appliances that the interchangeability of parts is obtained, and the production of work of a high mechanical standard at a reasonable price made possible. The machinery employed in this department of the business fills three large floors of the company's buildings.

THE PRESS ROOM

is in the basement of the main building, and contains a number of power punching presses, large and small, by means of which and of punches and dies of innumerable variety, the great multiplicity of punched pieces of iron, steel and brass which are required in the various classes of locks are produced. Here also are the tools by which the "bitting" of the keys is done. The workman sits before a small punching press operated by his foot, and having in front of him a large book containing in vertical columns page after page of numerical lists or figures. Guided by these he adjusts the machine by certain levers provided for the purpose, and thus determines the exact "bitting" required for each key. These "bittings" are what actuate the tumbler mechanism of the locks, and the variations in them are what give the permutations of the lock—that is, the difference between one key and another—so that each will open its own lock and no other, which in turn implies that each lock can be opened by its own key only.

THE FINISHING ROOM.

This also is in the basement of the main building, and contains lathes or spindles for driving emery wheels. These wheels, which are about 16 inches in diameter, are faced with emery of various grades of fineness and are driven by belts at a velocity of about one mile per minute.

The dust produced in this process is very injurious to the workmen, and it is a well-known fact that many men have died from the effects of inhaling it in establishments where no provision is made for its removal. In the Yale Lock Company's works the utmost pains are taken to remove this dust by means of large exhaust fans, the inlet boxes or tubes of which are so connected with the emery wheels as to produce a constant inflow of air around the sides of the wheels while in operation, thereby at once removing the dust and preventing its dissemination through the room.

The dust thus produced, and which contains a very large amount of brass, is disposed of in a manner which we believe is unique and not adopted in any other establishment. In other places where exhaust fans are used they discharge the dust from the emery wheels out of doors, where it is not only wasted, but usually floats back through the open windows surrounding the building, to the detriment of health and machinery. Here, however, these discharge pipes pass through a machine devised some years ago by Mr. Towne, president of the company, and known as a separator. The dust, which is in the form of an impalpable powder, so fine as to be capable of passing through the most minute crevices, is first passed through water, which catches and condenses a large percentage of it. That which is not taken up by the water is carried by the escaping current of air to another part of the machine where, by a very great enlargement, the velocity of this current is greatly reduced. At this point the escaping air passes through a series of bolting cloths which effectually arrest the remaining particles of brass dust, which then fall and gradually collect in the water receptacle below, while the air, now cleaned of its impurities, is allowed to escape out of doors. The dust collects in the water receptacle at the bottom of the machine, and is removed from time to time in the form of a thick mud. This, when dried, is placed in the crucibles and submitted to heat. By this process the emery and other impurities are either burned off or can be removed by skimming from the surface of the molten metal, leaving the latter pure and ready to be run into pigs or ingots. In this way many thousand pounds of brass have been recovered which otherwise would have been utterly wasted.

THE PLATING ROOM.

This is in the upper floor of the main building, and here are all the appliances needed for silver and nickel-plating, and also for the final finishing of the ornamental and decorative bronze goods made by the company. The dynamo-electric machine takes the place of the old-fashioned batteries, and the large vats for nickel-plating are provided with the patented form of nickel anode, made by the company for its own use and also for sale. This anode consists of grains of metallic nickel, securely attached to a carbon plate while the latter is in plastic condition. In this way the nickel is used in commercial form and without the expense and loss of casting it into plates. Moreover, these anodes can be kept at work until the nickel is entirely used up, whereas the cast anodes in common use, when less than half used become so spongy and brittle as to necessitate recasting, in which process it again loses considerably.

The company is very successful in its nickel-plating, and turns out a grade of work which is equaled in very few establishments. Its nickel-plating has the luster and white appearance of silver to a degree which makes it difficult to distinguish it from silver unless the two are placed together, while the nickel has the great advantage of hardness and non-liability to discoloration.

THE SETTING-UP ROOM.

This also is in the upper part of the main building, and it is here that the Yale locks are assembled to their keys and receive the complement of tumblers or pins.

In the manufacture of common locks the keys are adjusted to the lock by filing and fitting. In the case of the Yale locks, however, the tumbler mechanism or pins contained in each lock are fitted and adjusted to the desired key. The latter, as we have seen, are so made as to insure non-interchangeability, and the locks are adjusted to the keys by a process which involves no alteration of the latter; the great object is attained of producing locks by the thousand, no one of which can be opened except by its own proper key.

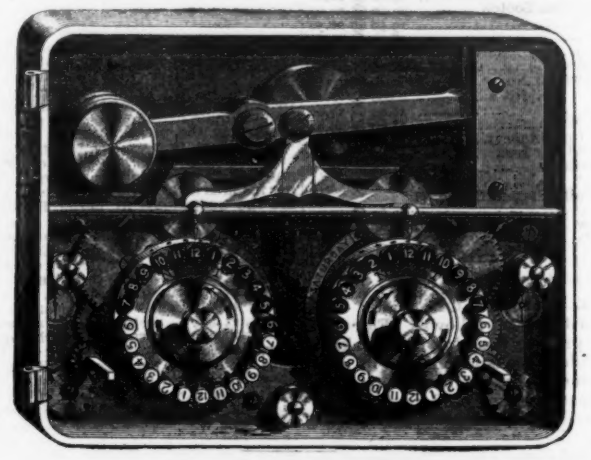

Fig. 8.

The pins or tumblers for the Yale locks are made in this room by a machine designed and built by the company for the purpose. They are made from German silver rods, which, passing into a machine at one end in the form of wire, come out at the other as finished tumblers.

Next to the setting-up room is

THE INSPECTING ROOM,

where all of the locks are carefully inspected, both at the several stages of their manufacture and after they are completed ready for setting up, and, finally, after they have been assembled and set up to their keys. After this final inspection they then pass to the packing room, where each is placed in a separate paper box with all its necessary screws and fittings, labeled and placed upon the shelves ready for packing and delivery or for shipment to the New York warerooms of the company.

A number of Yale locks for prison use are manufactured. The best for cell use is what is known as the Yale jamb lock, which is arranged to be built into the jamb or wall of the cell so as to project its bolt and lock into the door. The lock is thus entirely removed from the reach of the prisoner, and is contained in the solid masonry, leaving the door entirely unobstructed.

In addition to the Yale locks the company manufacture what are known as "Standard" locks. This is a full line of mortise door locks adapted to almost every use, and all of them provided with nickel-plated steel keys of the design shown in Fig. 6.

Fig. 6.

These are a well made tumbler lock of ordinary internal design, but as thoroughly well-made, both as to workmanship and materials, as are the Yale locks. These locks are perfectly adapted for all inside uses where great security is not specially desired, and their cost is somewhat less than that of the Yale locks.

Fig. 7 represents the "Standard" drawer lock, and is also very much cheaper. This lock has proved very popular since its introduction two years ago, and a great many of them have been sold.

Another specialty of the company is Dotterer's burglar-proof lock for freight car doors. The peculiarity of the lock consists in the mode of attachment to the door, so that it surrounds and grasps the iron rail on which the door is mounted. The bolt of the lock engages with notches cut in this rail by which the door can be locked in any desired position, and by attaching the lock to the rear corner of the door the opening of the door by sawing the wood surrounding the lock is made impossible. These locks are made throughout of steel, and are thus practically burglar-proof, since far more violence is required to destroy them than would suffice to break in the sides or roof of the car itself. Their material offers little or no temptation to thieves, and their permanent attachment

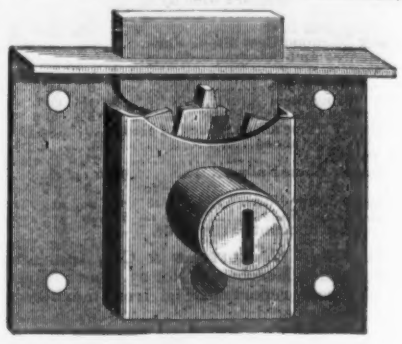

Fig. 7.

to the door makes it impossible for them to be accidentally detached or lost.

Fig. 8 represents the celebrated Yale time lock, for bank vaults and safes, the manufacture of which is one of the distinct specialties of the company. More than 1000 of these locks are now in use throughout the United States, and are doing their daily work of protecting both the valuables entrusted to them and the lives of the officers of the banks which use them to the fullest satisfaction of their owners.

The lock consists essentially of a bolting device operated by clockwork, the construction being such that by properly setting the dials the lock will automatically lock and unlock at certain given hours daily. During its locked periods it guards the door against any possible tampering with the fastenings, and renders absolutely nugatory any attempt to compel cashiers under threat of their lives to open the doors of their safes—a species of attack, which, under the name of masked burglaries, has of late years come into unpleasant prominence. These locks are furnished when desired with the so-called Sunday attachment, by the operation of which the unlocking of the lock every seventh day is automatically prevented.

Fig. 9.

In this department of the company's business is also included the Yale combination bank locks, which for some 15 years past have been known throughout the United States as among the best of their kind.

Still another specialty of the company is the manufacture of post-office equipments, including the well-known Yale lock boxes and drawers, which are now in use in post offices scattered all over the United States, and a small section of which is represented in Fig. 9.

More than 92,000 of these boxes are already in use, and their many advantages are so well-known as to render a detailed description of them here superfluous. The company furnishes not only lock-boxes, but also all other post office furnishings required to convert any empty apartment into a fully equipped post office ready for use. During the past 10 years the company have prepared designs for, and has furnished and equipped wholly or in part many hundred post offices, and in so doing have acquired a familiarity with and experience in this peculiar class of work greater probably than is possessed by any other individual or firm in the world.

The benefit of this experience is given to their customers, to whom they furnish on application complete designs of post office equipments, accompanied by specifications and estimates, which enable the intending purchaser to see exactly what the office will look like when erected, and to know in advance its exact cost complete and ready for service.

Included in this department of the business also are numerous articles for postal use, such as dating, canceling and money order stamps, inking pads, mailing and distributing tables, &c.

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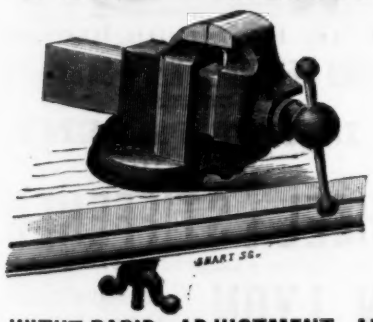

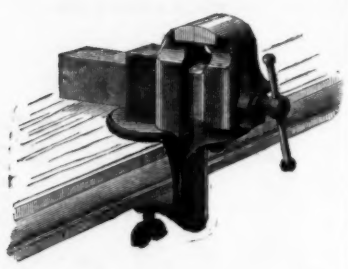

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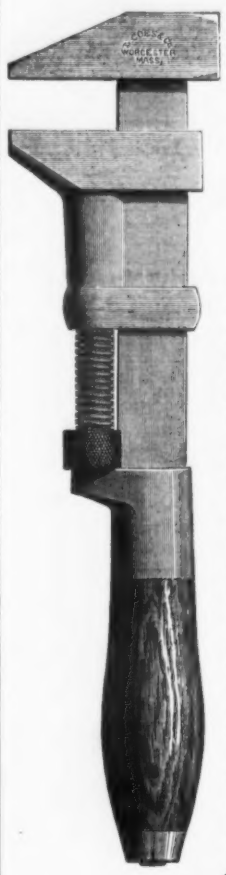

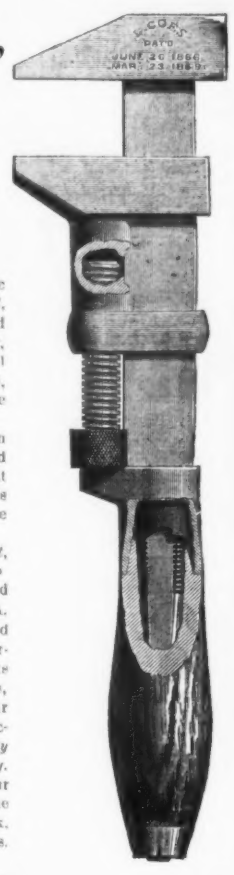

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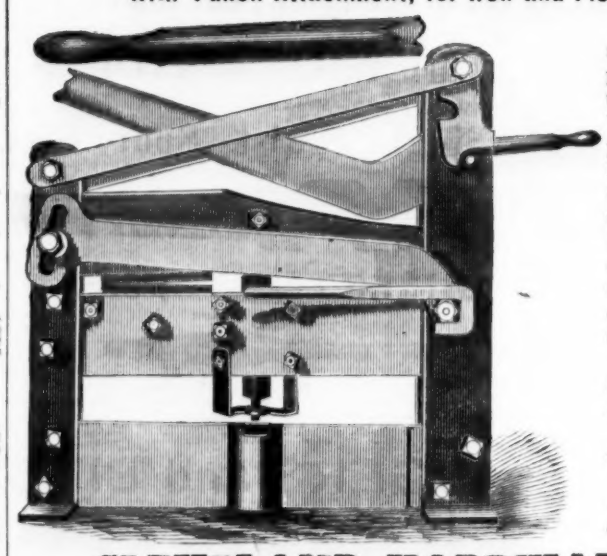

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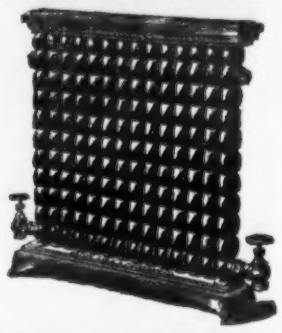

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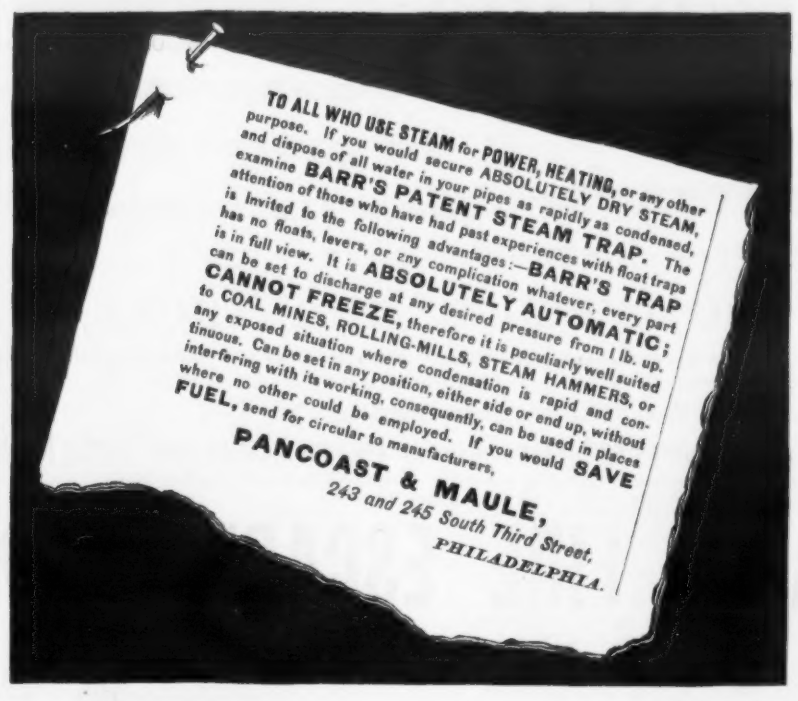
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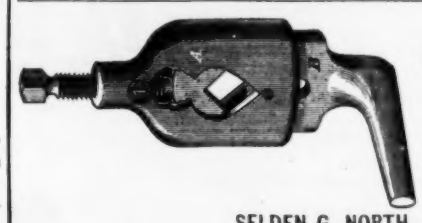

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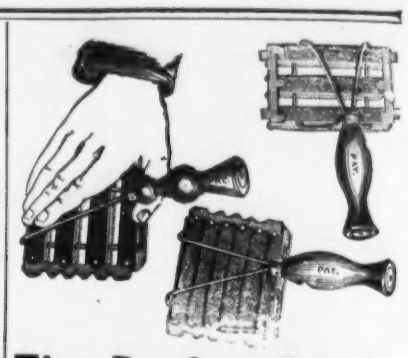

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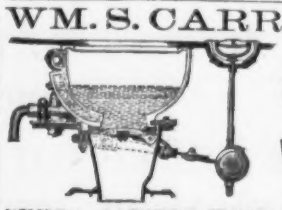

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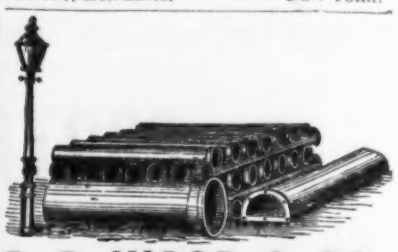

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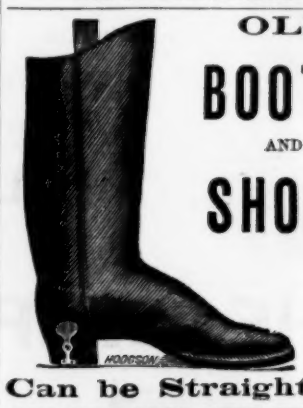

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The Iron Age Directory

and Index to Advertisements.

PAGE.

Agricultural Implements.
Hubbard, H. N., 323 E. 23d, N. Y. ... 6

Air Compressors.
Clayton James, 11 Water, Brooklyn, N. Y. ... 3

Alarm Money Drawers.
Tucker & Dorsey, Indianapolis, Ind. ... 13

Alarm Whistles and Speaking Tubes.
Ostrander W. R. 19 Ann, N. Y. ... 6

Anti-Friction Metals.
Reeves Paul S., Philadelphia, Pa. ... 40

Anvils. *Manufacturers of.*
Fisher & Norris, Trenton, N. J. ... 38
Richardson Mfg. Co., Worcester, Mass. ... 26

Armor Plates.
Moorhead & Co., Pittsburgh, Pa. ... 4

Augers, Bits, etc. *Manufacturers of.*
Clark Wm. A., Westville, Ct. ... 37
Harlow C. C. & Co., Bridgewater, Mass. ... 13
Ives, Wm. A. & Co., New Haven, Conn. ... 34
Jennings C. E. & Co., 98 Chambers, N. Y. ... 40
Pugh Job. T., Philadelphia, Pa. ... 26
The Conn. Valley Mfg. Co., Centerbrook, Conn. ... 26

Axes, Edge Tools, &c. *Manufacturers of*
D. R. Barton Tool Co., Rochester, N. Y. ... 26
Jones, M. H. & Co., Cohoes N. Y. ... 25

Axles, Springs, etc. *Manufacturers of.*
Brown D. Arthur & Co., Fisherville, N. H. ... 40
Wood, Smith & Co., Fort Plain, N. Y. ... 12
Cook R. & Sons, Winsted, Ct. ... 12
Borchkiss Guy C., Field & Co., Brooklyn, E. D. ... 35
The Ætna Spring and Axle Co., Bridgeport, Conn. ... 12
Wilson, Walker & Co., Pittsburgh, Pa. ... 4

Barn Door Hangers.
Moore, S. H. & E. Y., Chicago, Ills. ... 12

Bed Screws, *Maker of.*
Shelton Co., Birmingham, Conn. ...

Bellows. *Manufacturers of.*
Newcomb Bro's., 586 Water, N. Y. ... 38
Scott Geo. M., Chicago, Ill. ... 18

Bells (Sleigh,)
Bevin Bros. Mfg. Co., Easthampton, Conn. ... 8

Belting, Leather. *Makers of.*
Alexander Bros., 412 N. 3d., Phila. ... 35
Forepaugh Wm. F., Jr., & Bros., Phila. ... 35

Bird Cages. *Makers of.*
Heinz, Pierce & Munschauer, Buffalo, N. Y. ... 40
Jewett John C. & Sons, Buffalo, N. Y. ... 18
Lindeman O. & Co., 254 Pearl, N. Y. ... 3
Maxheimer John, 249 Pearl, N. Y. ... 3

Bit Braces. *Manufacturers of.*
Millers Falls Mfg. Co., 74 Chambers, N. Y. ... 25

Blocks, Tackle. *Makers of.*
Burr & Co., 31 Peck Slip, N. Y. ... 25
Penfield Block Works, Lockport, N. Y. ... 26
Providence Tool Co., Providence, R. I. ... 26

Blowers. *Makers of.*
Keystone Portable Forge Co., Philadelphia. ... 38

Bolt and Rivet Clippers.
Chambers Brothers & Co., Philadelphia, Pa. ... 8

Bolt Cutters.
Howard Iron Works, Buffalo, N. Y. ... 38

Bolts (Screw.)
Eagle Bolt Works, Philadelphia, Pa. ...

Bent and Shoe Rod Stiffeners.
Lyon N., Albany, N. Y. ... 26

Borax.
Coleman Wm. T. & Co., 180 Pearl, N. Y. ... 5

Brass Butts. *Makers of*
Tiebout W. J., 230 Pearl, N. Y. ... 34

Brass. *Manufacturers of.*
Anaconda Brass and Copper Co., 19 Cliff, N. Y. ... 2
Bridgeport Brass Co., Bridgeport, Conn. ... 2
Brass Goods Mfg. Co., 280 Pearl, N. Y. ... 2
Davol John & Sons, 100 John, N. Y. ... 2
Holmes, Booth & Haydens, 49 Chambers, N. Y. ... 2
Manhattan Brass Co. 83 Reade, N. Y. ... 2
Miller Edw. & Co., 35 Warren, N. Y. ... 2
Plume & Atwood Mfg. Co., 80 Chambers, N. Y. ... 2
Scovill Mfg. Co., 421 Broome, N. Y. ... 2
Waterbury Brass Co. 296 Broadway, N. Y. ... 2

Brass Founders.
Reeves Paul S. Philadelphia, Pa. ... 40

Bridge Builders.
Moseley Iron Bridge and Roof Co., 5 Dey, N. Y. ... 28

Buck Saws.
Boynton E. M. 80 Beekman, N. Y. ... 40

Butcher and Shoe Knives. *Manufacturers of.*
Wilson John, Sheffield, England. ... 33

Butts and Hinges.
American Spiral Spring Butt Co 82 Beekman, N. Y. ... 40
Sabin Mfg. Co., Montpelier, Vt. ... 27
Semple & Birge Mfg. Co., St. Louis, Mo. ... 6
Stanley Works, New Britain, Conn. ... 3
Union Mfg. Co., 98 Chambers, N. Y. ... 7

Calipers.
Victor Sewing Machine Co., Middletown, Conn. ... 36

Carriage Bolts. *Makers of.*
Townsend, Wilson & Hubbard, Phila. ... 12

Carriage Hardware. *Makers of.*
Smith H. D. & Co., Plantsville Ct. ... 13
Tapliff & Ely, Elyria, O. ... 13

Carriage Springs.
Dexter Spring Co., Hulton, near Pittsburgh, Pa. ...
Rome Trestle Co., (Limited) Rome, N. Y. ... 13

Car Axles.
Roberts A. & P. & Co., 265 S. 4th, Philadelphia. ... 5

Chains.
Reiter & Morton, Pittsburgh, Pa. ... 9

Chilled Rolls (Hollow)
Totten & Co Fulton Foundry, Pittsburgh, Pa. ...

Chisels. *Manufacturers of.*
Buck Bros., Millbury, Mass. ... 11

Clocks, Springs etc
Carry & Moen, 234 W. 29th, N. Y. ... 3
Dunbar Bros., Bristol, Conn. ... 8

Coal, *Miners of.*
Pardee A. & Co. 111 Broadway, N. Y. ... 33
The Hoboken Coal Co., Jersey City, N. J. ... 33

Coal and Coke Washing Machines.
Diescher S., Pittsburgh, Pa. ... 26

Coal Vases.
Sidney Shepard & Co., Buffalo, N. Y. ... 31

Coffee and Spice Mills.
Lane Brothers, Millbrook, N. Y. ... 6
Enterprise Mfg. Co., Philadelphia, Pa. ... 13

Compasses and Dividers, *Manufacturers of.*
Bemis & Call Hardw. & Tool Co., Springfield, Mass. ... 32

Cooper's Tools, etc., *Dealers in.*
D. R. Barton Tool Co., Rochester, N. Y. ... 26
Little Chas. E. 59 Fulton N. Y. ... 25

Copper.
Pope Cole & Co., Baltimore, Md. ... 2
The New Haven Copper Co., 295 Pearl, N. Y. ... 2

Corn Huskers.
Chambers, Bering & Quinlan, Decatur, Ill. ... 13

Corrugated Iron.
Moseley Iron Bridge and Roof Co., 5 Dey, N. Y. ... 28

Crucibles. *Manufacturers of.*
Wile, Siedel & Co., 709 Market, Phila. ... 35

Cupolas & Blowers.
Smith & Sayre Mfg. Co., 21 Cortlandt St., N. Y. ... 33

Curry Combs. *Manufacturers of.*
Hazelton D. W. & Co., Philadelphia, Pa. ... 35
Hotchkiss' Sons, Bridgeport, Conn. ... 12
Lawrence Curry Comb Co., 382 2d Avenue, N. Y. ... 26

Cutlery, *Importers of.*
Boker Hermann & Co., 101 Duane, N. Y. ... 33
Clatworthy F. & W., 82 Chambers, N. Y. ... 11
Fisher Jos. S., 411 Commerce, Phila. ... 11
Friedmann & Lauterjung, 14 Warren, N. Y. ... 11

Cutlery. *Manufacturers of.*
Burkinshaw Aaron, Pepperell, Mass. ... 11
Goodell Company, Antrim, N. H. ...
Meriden Cutlery Co., 49 Chambers, N. Y. ... 11
Naugatuck Cutlery Co., 89 Chambers, N. Y. ... 11
New York Knife Co., Walden, N. Y. ... 11
The Frary Cutlery Co., Bridgeport, Conn. ... 11
The Lamson & Goodnow Mfg. Co., 98 Chambers N. Y. ... 11

Differential Pulley Blocks.
Yale Lock Mfg. Co., 53 Chambers, N. Y. ... 7

Discount Tables.
Jennings S. H., Deep River, Conn. ... 20

Dog Muzzles.
Mercereau W. T. & J., 321 Broadway, N. Y. ... 12

Door and Gate Springs.
Dunne P. R., 182 Fulton, N. Y. ... 13
Quackenbush, Townsend & Co., 59 Reade, N. Y. ... 34
Van Wagoner & Williams, 82 Beekman, N. Y. ... 40

Door Stops and Holders.
Spangler & Co., Pittsburgh, Pa. ... 28

Drill Chucks. *Manufacturers of.*
Cushman A. F., Hartford, Conn. ...
Lambertville Iron Works, Lambertville, N. J. ... 26

Drilling Machines, *Makers of.*
Bickford H., Cincinnati, O. ... 40
Thorne, DeHaven & Co., Philadelphia. ... 16

Drop Forgings.
Boker Hermann & Co., 101 and 103 Duane, N. Y. ... 20
Rose Wm. & Bros., West Philadelphia, Pa. ... 38

Drop Presses.
Beecher & Peck, New Haven, Conn. ... 34

Edge Tools. *Makers of.*
The D. R. Barton Tool Co., Rochester, N. Y. ... 26
Doscher M., 4 and 6 Gold, N. Y. ... 25

Elevators. *Makers of.*
Crane Bros. Mfg Co., Chicago, Ill. ... 9
Lane & Bodley Co., Cincinnati, O. ... 39
Mason Volney W. & Co., Providence R. I. ... 40
Stokes & Parrish, Philadelphia, Pa. ... 38

Elevator Buckets.
Rivet Bucket Co., Chicago, Ill. ... 38
Rowland F. F. Brooklyn, N. Y. ... 38

Emery Wheels.
Lehigh Valley Emery Wheel Co., Weissport, Pa. ... 40

Engineers, Machinists, etc.
Southern States Coal, Iron & Land Co., South Pittsburg, Tenn. ... 6
Todd Joseph C., 30 Barclay, N. Y. ... 36

Engines, Caloric.
Brown Caloric Engine Co., 37 Lewis, N. Y. ...

Engines, (Locomotive)
Baldwin Locomotive Works, Philadelphia, Pa. ... 4

Engines, Steam. *Makers of.*
Ervien Chas. W. & Co., Kensington, Phila. ...
Fitchburg Steam Engine Co., Fitchburg, Mass. ... 38
Landis F. F. & A. B., Lancaster, Pa. ... 26
Lovegrove & Co., Philadelphia, Pa. ...
Payne B. W. & Sons, Corning, N. Y. ... 39

Export Factors.
Jennings S. H., Deep River, Conn. ... 20

Faucets, Brass, *Makers of.*
McNab & Harlin Mfg. Co., 56 John, N. Y. ... 26

Faucets, *Self-Measuring Makers of.*
Enterprise Mfg. Co., of Pa., Phila. and N. Y. ... 13

Feed Water Heater and Purifier.
Davis J. B. Hartford, Conn. ... 38

Felting and Wadding.
Bacon, Chas. N., Winchester, Mass. ... 17
Titcomb C. F., Boston, Mass. ... 2

Files, *Importers of.*
Carr J. & Riley, 82 John, N. Y. ... 32
Flagler Joseph S., 411 Commerce, Phila. ... 11
Frasse Peter A. & Co., 95 Fulton, N. Y. ... 8
Moss F. W., 80 John, N. Y. ... 34
Sanderson Bros. & Co., 16 Cliff, N. Y. ... 34

Files, *Manufacturers of.*
American File Co., Pawtucket, R. I. ... 8
Auburn File Works, 89 Chambers, N. Y. ... 8
Barnett G. & H. At and 43 Richmond, Phila. ...
Disston Henry & Sons, Phila. ... 29
Draper C. I. & Co., Sing Sing, N. Y. ...
Everhart James M., Scranton, Pa. ... 40
Heller & Bros., Newark, N. J. ... 8
Johnson & Bro., 1 Commercial, Newark, N. J. ...
McCaffrey & Bro., 1732 and 1734 N. 4th, Phila. ... 8
Paul Chas. B., Williamsburgh, N. Y. ... 8

Fire Brick, *Makers of.*
Borgner & O'Brien, Philadelphia, Pa. ... 17
Brooklyn Clay Retort and Fire Brick Works, Van Dyke, St., Brooklyn N. Y. ... 17
Evens & Howard, St. Louis, Mo. ...
Gardner, Stuart & Co., Pittsburgh ... 17
Hall A. & Sons, Perth Amboy, N. J. ... 17
Hall & Sons, Buffalo, N. Y. ... 17
Maurer Henry, 418 East 23d, N. Y. ... 17
Kreischer B. & Son, 58 Goerck, N. Y. ... 17
Newton & Co., Albany, N. Y. ... 17
Ostrander James & Son, Troy, N. Y. ... 17
Valentine M. D. & Bro., Woodbridge, N. J. ... 17
Watson John R. Perth Amboy, N. J. ... 17
Weber Adam, 633 E. 15th, N. Y. ... 17

Flint and Emery Paper and Cloths.
Baeder, Adamson & Co. 730 Market, Phila. ...

Flower Pot Stands.
Barnum E. T., Detroit, Mich. ...

Fluting Machines.
The American Machine Co., Philadelphia. ... 34
Weeks A. A., 52 John, N. Y. ... 13

Forges, Portable, etc.
Keystone Portable Forge Co., Philadelphia. ... 38

Fossiliferous Ores.
Brown T. J., Rockwood, Tenn. ... 6

Foundry Facings.
Paxson J. W. & Co., 514 Beach, Phila. ... 5
Whitehead Bros., 517 W. 15th, N. Y. ... 28

Furnaces. *Makers of*
Richmond & Potts, 119 S. Fourth, Phila., Pa. ... 5

Furniture Springs.
Cary & Moen, 234 W. 29th, N. Y. ... 3

Galvanized Iron.
Lefferts Marshall Jr., 90 Beekman, N. Y. ... 4

Grain Cradles.
Grant Fan Mill and Cradle Co., Melrose, Rensselaer Co., N. Y. ... 18

Grindstones.
Cooper & Hollis, Brooklyn, N. Y. ...
Wilson & Hughes Stone Co., Cleveland, O. ... 33
Wood, H. S. & Co., 38 West, N. Y. ... 33
Wood Walter R., 283 and 285 Front, N. Y. ... 32
Worthington & Sons, North Amherst, O. ... 33

Guns, &c.
Windmuller Louis & Roelker, 20 Reade N. Y. ... 20

Gunpowder, *Makers of.*
Kneeland F. L. (Dupont) 70 Wall, N. Y. ... 32
Lafin & Rand Powder Co. 26 Murray, N. Y. ... 32

Hardware Commission Merchants.
Biglin Philip S., 100 Chambers, N. Y. ... 9
Granam & Haines, 113 Chambers, N. Y. ... 34
Salomon L., 100 Chambers, N. Y. ... 11
Samuel S. L., 57 Cedar, N. Y. ... 7
Tennis & Wilson, 81 Beekman N. Y. ... 12
Walbridge G. B. & Co., 83 Reade, N. Y. ... 31

Hardware Dealers.
Brower John I. & Son, 288 Greenwich, N. Y. ... 27
Lloyd, Supplee & Walton, 625 Market, Phila. ... 33
Shepard Sidney & Co., Buffalo N. Y. ... 31

Hardware Importers.
Boker Hermann & Co., 101 Duane, N. Y. ... 33
King, Briggs & Co., 596 Broadway, N. Y. ... 11
Van Wart, Son & Co., 134 and 136 Duane, N. Y. ... 11
Windmuller Louis & Roelker 20 Reade N. Y. ... 20

Hardware Manufacturers.
American Spiral Spring Butt Co., 82 Beekman, N. Y. ... 40
Clark & Co., Buffalo, N. Y. ... 34
Coulter, Flagler & Co., 87 Chambers, N. Y. ... 13
Cowles Hardware Co., Unionville, Conn. ... 12
Enterprise Mfg. Co., Phila. ... 13
Haft, Bilven & Mead Mfg. Co., 107 Chambers, N. Y.
Lloyd, Supplee & Walton, 625 Market St. Phila. Pa. ... 33
Millers Falls Mfg. Co., 74 Chambers, N. Y. ... 25
Platt & Co., Buffalo, N. Y. ...
R. Bliss Mfg. Co., Pawtucket, R. I. ... 32
Russell & Erwin Mfg. Co., New York. ... 10
Shepard Hardware Co., Buffalo, N. Y. ... 8
Stanley Works, New Britain, Conn. ... 3
Union Mfg. Co. 99 Chambers, N. Y. ... 7
Van Wagoner & Williams 82 Beekman, N. Y. ... 40

Hardware Specialties.
Shepard Sidney & Co., Buffalo, N. Y. ... 31
Spencer & Underhill, 91 Chambers, N. Y. ... 8

Hardware, (Wagon)
Covert E. & J. C., Farmer Village, N. Y. ... 12

Harness Snaps.
Covert Mfg. Co., Troy, N. Y. ... 18

Hinges.
Lewis, Oliver & Phillips, Pittsburgh, Pa. ... 12
Scovill Mfg. Co., 419 to 421 Broome, N. Y. ... 19
Stanley Works, New Britain, Conn. ... 3

Hog Ringers.
Chambers, Bering & Quinlan, Decatur, Ill. ... 13

Hoisting Engines, *Makers of.*
Crane Bros. Mfg. Co., Chicago, Ill. ... 9
Mundy J. S., Newark, N. J. ... 38

Hoisting Machines.
Harrington Edwin & Son, Philadelphia, Pa. ... 39
Mason Volney W. & Co., Providence, R. I. ... 40

Hooks (Cotton & Bale.)
New York Handle & Mallet Works, 456 E. Houston. ... 34

Horse Nails, *Makers of*
Ausable Horse Nail Co., 4 Warren, N. Y. ... 8
Champion Steel Horse Nail Co., Appleton, Wis. ...
Globe Nail Co., Boston, Mass. ... 33
HP Horse Nail Co., Cleveland, O. ... 38
National Horse Nail Co., Vergennes, Vt. ... 21
Northwestern Horse Nail Co., Chicago, Ill. ... 33
Platt & Co., Buffalo, N. Y. ... 31
Putnam Nail Co., Neponset, Mass. ... 33
Scetson N. Jr., 73 Pearl, N. Y. ... 33

Horse Shoes, *Makers of.*
Boston Rolling Mills, 17 Batterymarch, Boston. ... 5
Burden Iron Works, Troy, N. Y. ... 4
Rhode Island Horse Shoe Co., Providence, R. I. ... 33
Schoenberger & Co., Pittsburgh, Pa. ... 4

Hydrants, &c.
McLean John, 300 Monroe, N. Y. ... 39

Hydraulic Jacks.
Dudgeon Richard, 24 Columbia, N. Y. ... 36

Ice Balances.
Forscaner Chas., 41 Rivington, N. Y. ... 13

Insurance, Boiler.
Hartford Steam Boiler Inspection and Insurance Co. ... 39

Iron Brokers.
Boynton Geo. A., 70 Wall, N. Y. ... 4
Erting Edward J., Philadelphia, Pa. ... 5
Hatch A. G., Pittsburgh, Pa. ... 4
Hazard T. D 204 Pearl N. Y. ... 4

Iron, Charcoal, *Warm or Cold Blast.*
Quincy John W., 98 William, N. Y. ... 4

Iron Commission Merchants.
Adams Hugh W., 56 Pine, N. Y. ...
Lowe S. B., Chattanooga, Tenn. ... 6
Spooner & Collins, St. Louis, Mo. ... 5

Iron, Pig, *Importers of.*
Williamson James & Co., 69 Wall, N. Y. ... 4

Iron Dealers.
Abeel Brothers, 190 South, N. Y. ... 4
Bonnell, Botsford & Co., Youngstown, O. ... 5
Borden & Lovell, 79 and 71 West, N. Y. ... 4
Carmichael W. J., 130 & 132 Cedar, N. Y. ... 4
Cooney Daniel F., 83 Wassington, N. Y. ... 4
Huerstel G., 99 Market Slip, N. Y. ... 4
Fuller, Lord & Co., 126 Greenwich, N. Y. ... 4
Harrison & Gilloon, 558 to 562 Water, N. Y. ... 4
Jackson & Chase, 206 and 208 Franklin, N. Y. ... 4
Judson B. F., 457 and 459 Water, N. Y. ...
Kane C., Pittsburgh, Pa. ... 18
Ogden Wallace, 85, 87, 89 and 91 Elm, N. Y. ... 4
Pierson & Co., 24 Broadway, N. Y. ... 4
Pullman J. Wesley, Philadelphia, Pa. ... 5
Quincy John W., 98 William, N. Y. ... 4
Richards D. W. & Co., 92 Mangin St., N. Y. ... 4
Wallace Wm. H. & Co., Albany and Washington streets, N. Y. ... 4
Warner A. B. & Sons, 28 and 29 West, N. Y. ... 4
Williamson James & Co., 69 Wall, N. Y. ... 4
Whitney A. R. & Bro. 58 Hudson N. Y. ... 4

Iron, *(Manufacturers' Agents.)*
Levis & Kimball, Philadelphia, Pa. ... 5

Iron, *Manufacturers of.*
Boston Rolling Mills, 17 Batterymarch, Boston. ... 5
Bradley, Reis & Co., 23 Cliff, N. Y. ... 5
Burden Iron Works, Troy, N. Y. ... 4
Cleveland Rolling Mill Co., Cleveland, O. ... 6
Collins H. E. & Co., Pittsburgh, Pa. ... 5
Everson, Macrum & Co., Pittsburgh, Pa. ... 4
Houdlette & Ellis, Boston, Mass. ... 4
Kirkpatrick, Beale & Co., Pittsburgh, Pa. ... 4
Leonard John, 450 & 451 West st. N. Y. ...
Oxford Iron Co., 81 Washington, N. Y. ... 4
Phoenix Iron Co., 410 Walnut, Phila. ... 5
Roane Iron Co., Chattanooga, Tenn. ... 6
Rowland James & Co., 920 N. Delaware, Phila. ... 5
Rowland Wm. & Harvey, Phila. ...
Shoenberger & Co., Pittsburgh, Pa. ... 40
Taylor & Boggis, Cleveland, O. ... 6
The Passaic Rolling Mill Co., Paterson, N. J. ... 4
Vulcan Iron and Nail Works, Chattanooga, Tenn. ... 6
U. S. Iron and Tin Plate Co., Pittsburgh, Pa. ... 4
Wasson Car and Foundry Co., Chattanooga, Tenn. ... 6
Zug & Co., Pittsburgh, Pa. ... 4

Iron, Planished Sheet *Manufacturers of*
Wood W. D. & Co., Pittsburgh, Pa. ... 4

Iron, Swedish. *Importers of.*
Mitander Nils, 69 William, N. Y. ... 4

Ironware.
Lalance & Grosjean Mfg. Co., 59 Beekman, N. Y. ... 7

Ironware, (Granite)
St. Louis Stamping Co., St. Louis, Mo. ... 18

Kitchen Sinks.
Magee Furnace Co., Boston, Mass. ... 28

Lanterns, *Manufacturers of.*
Dietz R. E., (Tubular) 54 and 56 Fulton, N. Y. ... 40
Howard & Morse 45 Fulton, N. Y. ... 2

Lathe Dogs.
North Selden G., Philadelphia. ... 26

Lathes.
Johnson, Jr. Israel H. & Co., Philadelphia. ... 34
Shepard H. L. & Co., Cincinnati, O. ... 32

Lawn Mowers.
Mast, Foos & Co., Springfield, O. ... 12

Lead Pipe, &c., *Manufacturers of.*
Bayley, Farrell & Co., Pittsburgh, Pa. ... 2

Levels.
Disston Henry & Sons, Phila. ... 29

Locks. *Manufacturers of*
Bohannan Wilson, Broadway and Kossuth, Brooklyn E. D. ... 34
D. K. Miller Lock Co., Philadelphia, Pa. ... 28
Hoyt Fred. J., 733 Broadway N. Y. ... 18
Romer & Co., Newark, N. J. ... 34
Smith & Egge Mfg. Co. Bridgeport Conn. ... 6
Stewart & Mattson, Philadelphia, Pa. ... 13
Union Nut Co., 99 Chambers, N. Y. ... 34
Yale Lock Mfg. Co., 53 Chambers, N. Y. ... 7

Machinery, *Makers of.*
Bliss & Williams, 167 Plymouth, Brooklyn. ... 39
Pittsburgh Mfg. Co., Pittsburgh, Pa. ... 14
Pratt & Whitney Co., Hartford, Conn. ... 39
Sellers Wm. & Co., 1600 Hamilton Phila. ... 39
The Bullard Machine Co., 14 Dey, N. Y. ... 20
Wetherill Robert & Co. Chester, Pa. ... 39

Machine Screws, *Makers of.*
Lyon & Fellows Mfg. Co., Williamsburg, N. Y. ... 12

Machinists' Tools, *Makers of.*
Blaisdell P. & Co., Worcester Mass. ... 32
Davis A. J. & Co. Newark N. J. ... 39
Flanders L. B., Philadelphia. ... 39
Frasse & Co., 62 Chatham, N. Y. ... 38

Malleable Iron Castings, *Maker of.*
Hammer & Co., Branford, Ct. ... 38

Mallets.
N. Y. Handle & Mallet Works, 456 E. Houston. ... 34

Manganese.
Pyrolusite Manganese Co., 214 Pearl, N. Y. ... 33

Measuring Tapes.
Eddy Geo M. & Co., 353 Classon Ave., Brooklyn, N. Y. 9

Meat Chopping Machinery.
Murray Iron Works, Burlington, Iowa. ... 8

Metal Dealers and Brokers.
Crane D. O., 194 John, N. Y. ... 4
Dickerson, Van Dusen & Co. 29 & 31 Cliff, N. Y. ... 2
Gregg H. L. Co. 103 Walnut, Phila. ... 5
Phelps, Dodge & Co., Cliff, bet. John & Fulton, N. Y. 2
Purves A. & Son, cor. South and Penn, Phila. ... 5
Quincy J. W., 98 William, N. Y. ... 4
Sellew R. & Co., St. Louis Mo. ... 2

Metal Elbows.
Hogen Elbow Co., Cleveland, O. ... 36

Metallurgists.
Britton J. Blodgett 309 Walnut Phila. ... 5

Metals Perforated.
Hayes G., 71 8th ave. ... 2

Metal Roofing.
Brass Goods Mfg. Co., 280 Pearl N. Y. ... 2

Miners' Candles. *Makers of*
James Boyd's Sons, 10 and 12 Franklin, N. Y. ... 38

Mineral Lands, *Dealer in*
Hoskins W. A. Chattanooga, Tenn. ... 6

Mineral Wool.
Elbers, Alexander D., 26½ Broadway, N. Y. ... 5

Models.
Burrows Wm., 99 Fulton, N. Y. ... 40
Ebernard Geo. F. & Co., Canton, O. ... 24

Mouse Traps.
Dietz R. E., 54 and 56 Fulton, N. Y. ... 40
Oliver K., 106 & 108 Beekman, N. Y. ... 3
Ripley Mfg. Co., Unionville, Conn. ... 3

Mowing Machine Knife Grinder.
Fisher Henry, Canton, O. ... 37

Nails
Schoenberger & Co., Pittsburgh, Pa. ... 4
Zug & Co., Pittsburgh, Pa. ... 4

Nail Machinery.
Coyne & Hatry, Pittsburgh, Pa. ... 4

Nickel Platers.
Hartman John, 37½ N. Seventh, Philadelphia. ... 28
Jackson Geo. W., 21 E. 13, N. Y. ... 28

Nickel Platers' Supplies.
Colt A. T., 47 Beekman, N. Y. ... 28
Condit, Hanson & Van Winkle, Newark, N. J. ... 28
Zucker & Levett, 639 & 41 W. 51st, N. Y. ... 27

Night Latches.
Many Francis, 143 Chambers, N. Y. ... 8

Norway Shapes, *Rollers of.*
Rowland Wm. & Harvey, Frankford, Phila. ... 40

Note Broker.
Gallaudet F. W. 3 and 5 Wall, N. Y. ... 6

Nut Tapping Machines.
Howard Iron Works, Buffalo, N. Y. ... 38

Nuts, Bolts, etc., *Makers of.*
Fuller Bros. & Co., 139 Greenwich, N. Y. ... 4
Haskell W. H. & Co., Pawtucket, R. I. ... 34
Lewis, Oliver & Phillips, Pittsburgh, Pa. ... 12
Roseberry Geo. D., Pottsville, Pa. ... 4
Russell, Birdsall & Ward, Port Chester, N. Y. ... 40
Shelton Co., Birmingham, Conn. ... 40
Standard Nut Co., Pittsburgh, Pa. ... 6
Sternbergh J. H., Reading, Pa. ... 40
Union Nut Co., 99 Chambers, N. Y. ... 34

Oil Lubricating, *Makers of*
Lescer Oil Co., 81 Malden Lane, N. Y. ... 38

Oil Stones.
Boyd & Chase 107th and Harlem River, N. Y. ... 33

Oil Stoves.
Florence Machine Co., Florence, Mass. ... 28
Pool Geo. & Sons, 70 & 72 Fulton, Brooklyn, N. Y. ...

Old Iron, etc.
Gregg H. L. & Co., 103 Walnut, Philadelphia. ... 5

Packing (Steam).
"Empire Packing," Canfield Mfg. Co., Philadelphia. 36
Symonds & Co., Philadelphia. ...

Paints and Oils, *Dealers in.*
Devoe F. W. & Co., 117 Fulton, N. Y. ...

Pans, (Dripping and Bread,)
Lewis, Daizell & Co., Pittsburgh, Pa. ... 8

Patent Solicitors.
Howson & Son, Phila. and Washington, D. C. ...
Lenz & Schmidt, Berlin, N. W. ... 7
Spencer A. H. 28 State, Boston, Mass. ...
Stetson Thomas D. 23 Murray N. Y. ... 1

Pens (Steel).
Perry & Co., Limited, 112 & 114 William, N. Y. ... 8

Picks, *Makers of*
Pierson & Co., 24 Broadway, N. Y. ... 2

Pipes, Fittings, etc., *Makers of.*
Eaton, Cole & Burnham Co., 59 John, N. Y. ... 26
McNab & Harlin Mfg. Co., 56 John, N. Y. ... 26
Pancoast & Maule, 227 Pear, Phila. ... 26

Pipe Tongs.
Browning Joseph, Philadelphia. ... 35

Pipe, Water and Gas, *Makers of.*
McNeal & Archer, Burlington, N. J. ... 4
Wood R. D. & Co., 400 Chesnut, Phila. ... 26

Plane Irons, *Manufacturer of*
Buck Bros., Millbury, Mass. ... 11
D. R. Barton Tool Co., Rochester, N. Y. ... 26

Planes, *Manufacturers of*
Bailey Leonard & Co., Hartford, Conn. ... 13
Bailey Wringing Machine Co., 99 Chambers, N. Y. ... 25
D. R. Barton Tool Co., Rochester, N. Y. ... 26
Stanley Rule & Level Co., 35 Chambers, N. Y. ... 28

Plated Ware
Hall, Elton & Co., 75 Chambers, N. Y. ... 11

Pliers.
Hagstoz & Thorpe, Ledger Building, Phila. ... 11

Plumbers' Materials, *Manufacturers of*
Everhart Jas. M., Scranton, Pa. ... 40
Carr Wm. S. & Co. 106 Centre, N. Y. ... 28

Pocket Knives.
Boker Hermann & Co., 101 Duane, N. Y. ... 11

Portable Cooker.
Thorne G. L. & Co. 76 Warren, N. Y. ... 40

Presses, Power, *Makers of.*
Bliss & Williams, 167 Plymouth, Brooklyn. ... 39
Merriman A. H., West Meriden, Ct. ... 39
The Stiles & Parker Press Co., Middletown, Ct. ... 39

Pressure Blowers, *Makers of.*
Keystone Portable Forge Co., Philadelphia. ... 38

Printers.
E. S. Dodge Printing Co., 91 Chambers, N. Y. ... 13

Pulleys, Friction.
Mason Volney W. & Co., Providence, R. I. ... 40
Penfield Block Works, Lockport, N. Y. ... 26
Providence Tool Co., Providence, R. I. ... 26

Pump Pistons.
Sprague Wm. & Co., Philadelphia, Pa. ... 39

Pumps, *Makers of.*
Douglas W. & B., Middletown, Conn. ... 7
Rumsey & Co., Seneca Falls, N. Y. ... 7
Rumsey S. M. & Co., St. Louis, Mo. ... 36
Southern Pump and Pipe Co., Chattanooga, Tenn. ... 6
Union Mfg. Co., 98 Chambers, N. Y. ... 7

Railroad Supplies.
Jackson & Tyler Baltimore, Md. ... 36

Rails, Iron or Steel, *Makers of.*
Atkins Bros., Pottsville, Pa. ... 6
Cambria Iron Co., Johnstown, Pa. ... 5
Cleveland Rolling Mill Co., Cleveland, O. ... 6
The Edgar Thomson Steel Co., 57 Broadway, N. Y. ... 33

Railway, Car and Locomotive Forgings.
Wilson, Walker & Co., Pittsburgh, Pa. ... 4

Revolving Scrapers.
Revolving Scraper Co., Columbus, O. ...

Rivets.
Grundy, Geo. C. 168 Greenwich, N. Y. ... 34
Hoopes & Townsend, Philadelphia, Pa. ... 12
Old Colony Rivet Works, Kingston, Mass. ... 12
Townsend W. P. & Co., Pittsburgh, Pa. ... 12

Road Scrapers, &c.
Semple & Birge Mfg. Co., St. Louis, Mo. ... 6

Rolling Mill Machinery, etc., *Manufacturers of.*
Moore James, Cor 16th and Buttonwood, Phila. ... 39

Rules, *Manufacturers of.*
Stanley Rule and Level Co., 35 Chambers St. ... 18
Stephens & Co., Riverton, Conn. ... 37

Sad Irons.
American Machine Co., Philadelphia, Pa. ... 34
Enterprise Mfg. Co. Philadelphia. ... 13

Sand and Emery Paper, *Makers of*
Baeder, Adamson & Co., 730 Market, Phila. ...

Sash Locks.
Payson & Co., Chicago, Ill. ... 28

Saws, *Makers of.*
American Saw Co., Trenton, N. J. ... 37
Boynton E. M., 80 Beekman, N. Y. ... 40
Disston Henry & Sons, Phila. ... 29
Peace & Hogan, Williamsburg, N. Y. ... 37
Wheeler, Madden & Clemson Mfg. Co., Middletown, N. Y. ... 37

Saw Frames, Wood, *Makers of.*
Peace Harvey W., Williamsburg, N. Y. ... 37

Scales, *Manufacturers of.*
Brandon Mfg. Co., Brandon, Vt. ... 7
Chattillon John & Sons, 91 Cliff, N. Y. ... 9
Richie Bros., 9th above Master, Phila. ... 19
Southwark Hardware Co., Philadelphia. ... 31

Scoops.
Semple, Birge & Co., St. Louis, Mo. ... 19

Screws, *Makers of.*
American Screw Co., Providence, R. I. ... 16
Miles F. S., 205 Quarry, Phila. ... 12
Philadelphia Screw Co., Philadelphia Pa. ...
Russell & Erwin Mfg. Co., New York. ... 10

Screws, *Importers of.*
Bruce Geo. W., 1 Platt, N. Y. ... 6

Screw Cutting Machinery.
Howard Iron Works, Buffalo, N. Y. ... 38
Wiley & Russell Mfg. Co., Greenfield Mass. ... 38

Screw Drivers, *(Improved) Makers of.*
Disston Henry & Sons, Phila. ... 29
Wilkinson H., Collinsville, Conn. ... 11

Scythe Stones.
Dishman F. S., New Albany, Ind. ... 31
Pike A. F., East Haverhill, N. H. ... 18

Sewer Gas Traps.
Ruhrer S., Cleveland, O. ... 28

Shafting.
Wood Thomas, Philadelphia. ... 38

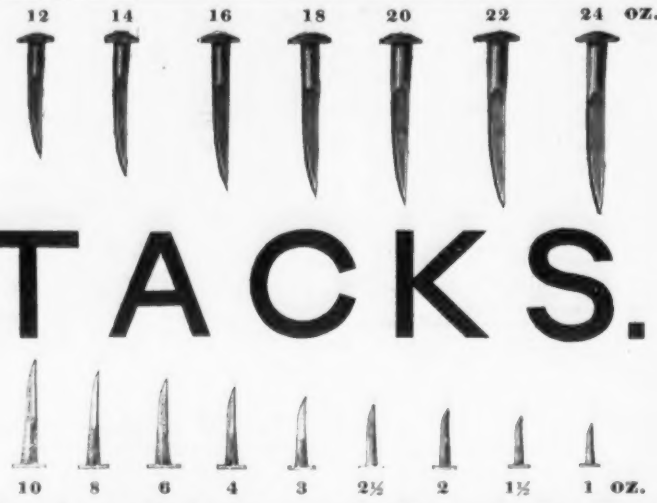
Shovels, &c.
Hubbard, Bakewell & Co., Pittsburgh, Pa. ... 28
Kimball Shovel Co., Baltimore, Md. ... 34
Remington E. & Sons, 57 Reade, N. Y. ... 37
Rowland B. & Co., Philadelphia. ... 17

Shot, etc.
Sparks Thos. W., 121 Walnut, Philadelphia. ... 37

Shears.
Cleveland Hardware Co., Cleveland, O. ... 25

Shears (Sheep).
Hildick A. H. & Co., 12 Warren, N. Y. ... 11
Wilkinson H., Collinsville, Conn. ... 11

Side Spring Connecting Rods.
Topliff & Ely, Elyria, O. ... 13



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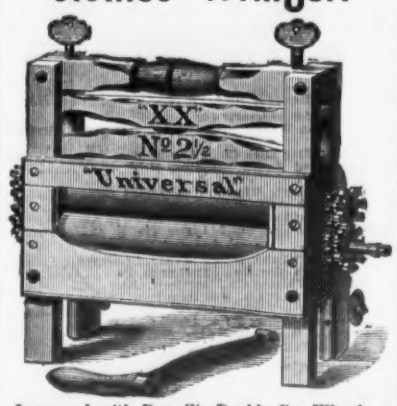

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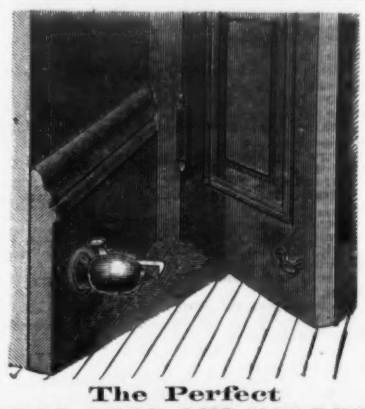

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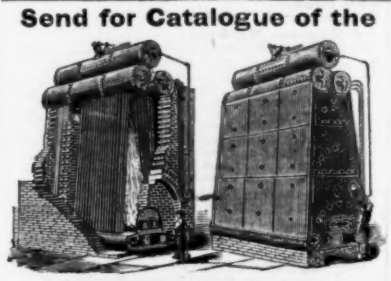

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Safety Steam Boiler.

The Boiler that made the hottest, dryest and greatest quantity of Steam at the Centennial Exhibition. Tubes never require cleaning or scraping. Boilers in use for four years without getting dirty.

J. C. & F. FIRMENICH,

Office, *13 Mortimer Street, Buffalo. N. Y.*

Moseley Iron Bridge & Roof Co.,

CORRUGATED IRON

Buildings, Roofs, Shutters, Doors, Iron Sashes, Skylights, &c.

5 Dey Street, New York.

WESTON DYNAMO-ELECTRIC MACHINE

NICKEL.

The rapid increase in the use of Nickel-Plating owing to the introduction of the Weston Machine and the very low price of nickel material, enables us to give greatly reduced estimates for complete outfits.

We are furnishing outfits specially adapted for Stove Work, giving a pure white deposit on plain or mat surfaces.

Outfits complete, with Dynamo-Electric Machine Tanks, Anodes, Solution, &c., &c., $250.

We beg to refer to the following Stove Manufacturers among 500 other houses using the Weston Machine: Richardson & Boynton, S. S. Jewett & Co., Detroit Stove Works, Michigan Stove Co., Co-operative Stove Co., E. & C. Gurney, Hamilton & Toronto, and many others.

INFRINGEMENTS.

We call attention to infringements of the Weston Machine, in which Automatic Switches are used to prevent change of current. The Weston Co. are owners by grant or purchase of all forms of Automatic Switches for Plating Machines. The adoption of these machines will certainly lead to great loss to parties purchasing or using them.

CONDIT, HANSON & VAN WINKLE

Sole Agents NEWARK, N.J. U.S.A.

GEO. W. JACKSON,

Successor to S. S. OWEN & CO.,

Nickel Plater

And Polisher of all kinds of Metals,

211 East 22d Street, bet. 3d and 4th Avenues,

NEW YORK.

NICKEL PLATING.

PHILADELPHIA. 37½ N. 7th St. WORKS.

PLEASE NOTICE THAT THE

Hubbard, Bakewell & Co. Corrugated Strap Scoop

IS BETTER THAN THE PLAIN, FOR REASONS HERE SUGGESTED.

When introduced they readily bring an advance on regular Straps of ten cents each.

MANUFACTURED BY

HUBBARD, BAKEWELL & CO., Pittsburgh, Pa.

ACKNOWLEDGED SUPERIOR TO ALL OTHERS.

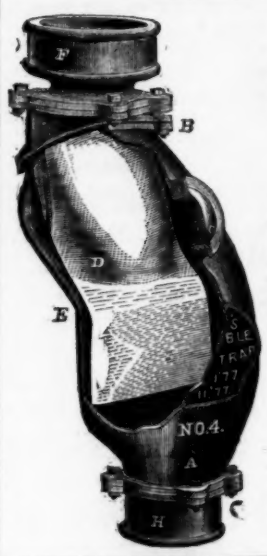
With our present **large variety** and constant additions of **new Patterns,** we are enabled for the **Season** of 1878 to meet the requirements of all. To **the Dealer** who is desirous to secure the **Best Stoves** in the market, we would **solicit** he correspond with us and **order Samples** which we will **guarantee** to fully meet all **recommends.**

We manufacture Stoves for burning all kinds of fuel.

THE GARLAND BASE BURNER,

Acknowledged Favorite, will appear for season of 1878 with **entire changes,** which cannot fail to make it the **Leading Base Burner.**

Send for descriptive catalogue, price list, &c.



BUHRER'S

Infallible Sewer Gas Trap

A SURE AND EFFECTIVE SEAL

Against Sewer Gas.

The annexed cut represents the construction of this Trap, the essential feature of which is the **Valve** (D), made of pure rubber, treated so as to resist the action of Sewer Gas, &c. The upper end of this valve has a collar around it, which is fastened between the flanges (B) of the case and hangs loosely, suspended from the top, thus securing the easy and rapid passage of waste and water through it, after which the sides of the valve come together and form a perfect and effective seal. The case (A) which contains the valve is made of cast iron, enameled on its inner surface, and is constructed so as to form a rest for the valve and facilitate its instant closing.

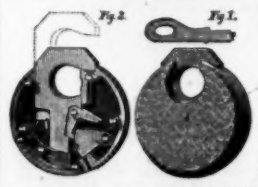
S. BUHRER, Inventor & Manufacturer,

Cleveland, O.

WHOLESALE AGENTS.

W. & J. B. GIBSON, 17 and 19 East Ninth St., Cincinnati, O.
L. WOLFF MFG. CO., 109 and 111 West Lake St., Chicago, Ill.
HAMBLIN & MATHEWS, 82 and 84 North St., Boston, Mass.
C. A. BLESSING, 44 North Fifth St., Philadelphia, Pa.
THE J. L. MOTT IRON WORKS, 88 & 90 Beekman St., New York.

Please send for circular.



D. K. MILLER LOCK CO.,

712 Cherry St., Philadelphia.

Greatly improved. Prices reduced. As now made it is the best and most economical Pad Lock for all uses extant. Appreciated by all who use them. For simplicity, compactness, durability, convenience and security it has no equal. Springs now made from the celebrated Phosphor Bronze. We make these Locks with Master Keys when so ordered. Largely used by the U. S. Government, Railroads, Corporations, etc., etc. Samples of 2¼ in. size sent per mail on receipt of one dollar.

DUC'S IMPROVED ELEVATOR BUCKET.

Endorsed by the leading millers and manufacturers in the country. NO CORNERS TO CATCH; requires less power to run; will throw clean every time; made of the best charcoal stamping iron, and positively indestructible; cost about the same as tin or sheet iron square buckets. Ask your nearest Mill Furnishing House or Millwright for them. We carry a stock of 20,000 of these buckets and can fill orders immediately. Purchasers are cautioned against buying any other spherical bucket. Samples furnished. Address

T. F. ROWLAND, Sole Manufacturer *Brooklyn, E. D., New York.*

A. T. COLT,

Nickel-Platers' Supplies.

ARMATURE ELECTRO-PLATERS' MACHINES.
PURE NICKEL in grain, Anodes, Sulphates and Chloride,
COBALT, metallic & sulphate,
VIENNA LIME, CROCUS,
ROUGE, COMPOSITION
EMERY, TRIPOLI,
CYANIDE POTASSIUM
BATTERIES & MATERIALS,
BUFFING LATHES, &c.
Silver (.999 pure) granulated or rolled. Gold and Platinum rolled to order. **47 Beekman St., N. Y.**

JOHN W. QUINCY

98 William Street, New York.

NICKEL.

Solder, Lead, Block Tin, and other Foundry Metals. Cut Nails.

HENRY DISSTON & SONS

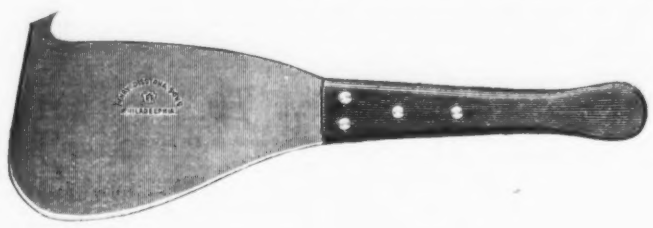
Keystone Saw, Tool, Steel & File Works.

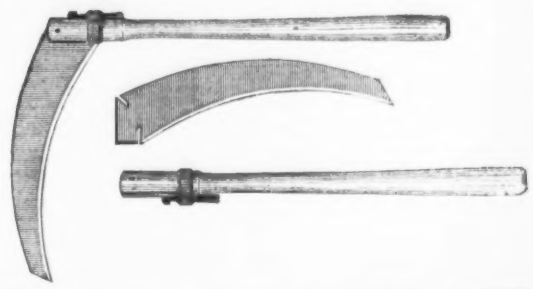
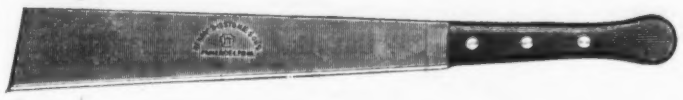
FRONT AND LAUREL STREETS, PHILADELPHIA.

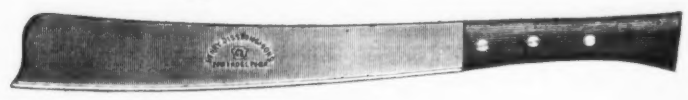
Branch Works, Tacony, Philadelphia. **Branch House, Randolph & Market Streets, Chicago, Ill.**

CANE AND CORN KNIVES.

Special Cane Knives, any Style and Shape, Made to Order.



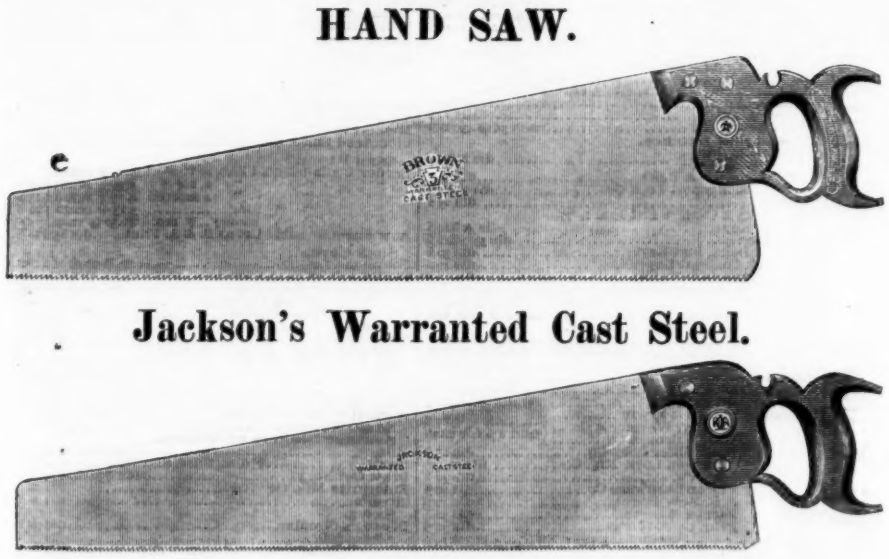


DISSTON'S CELEBRATED No. 7, HAND SAW.

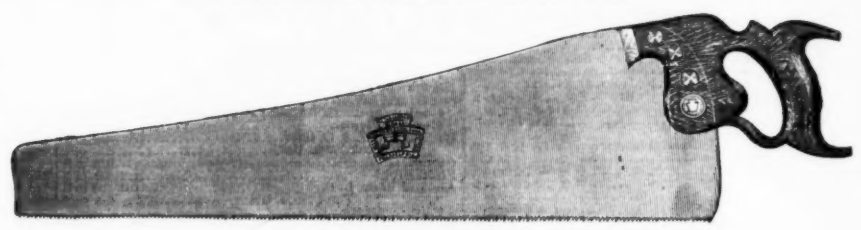
D 8 HAND SAW.

HAND SAW.

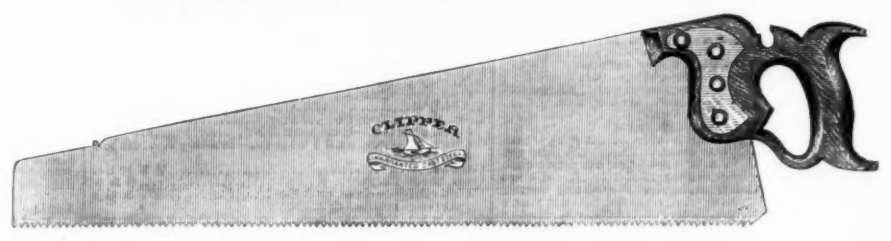
Jackson's Warranted Cast Steel.

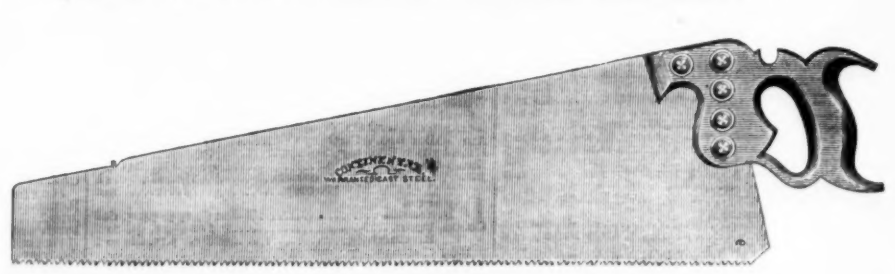


CENTENNIAL No. 76.

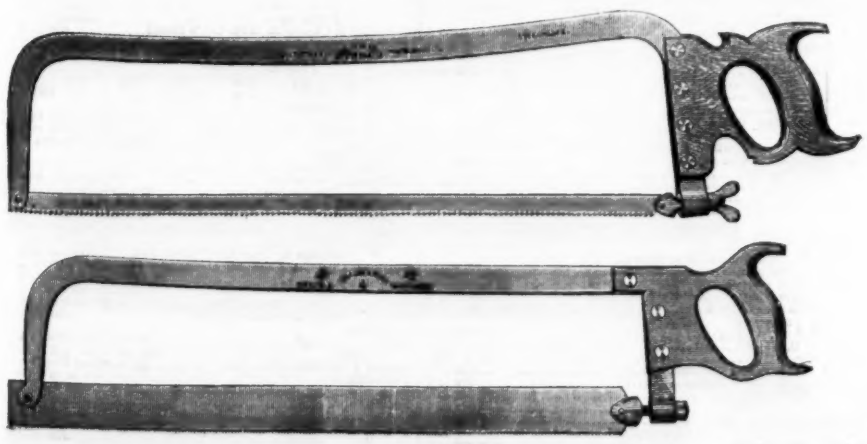


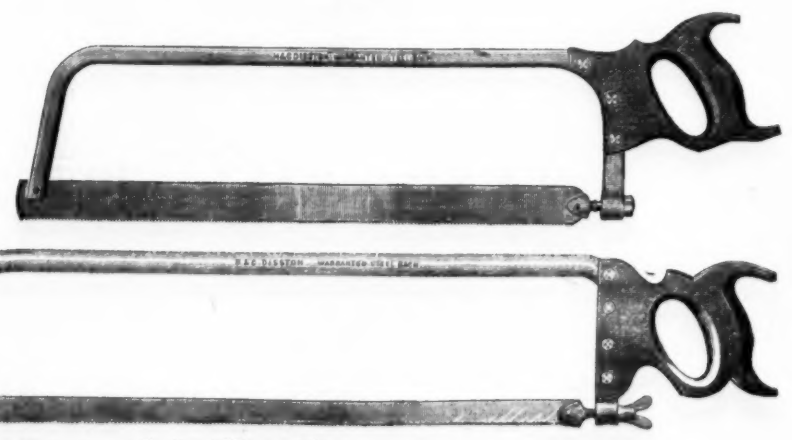
SPECIAL SAWS Made to Order.





HENRY DISSTON & SONS' BUTCHERS' BOW BACK SAWS





New York Wholesale Prices, May 22, 1878.

HARDWARE.

Anvils.
American ₩ lb 14c—dis 20 %
Wrighe's ₩ lb gold 10¼c over 250 lbs 10¾c, gold
Armitage's Mouse Hole gold 9½ c 10c
Wilkinson's ₩ lb gold 11c
Eagle Anvils (American) ₩ lb 9c dis 20 %

Apple Parers, &c.
Turn Table ₩ doz $6.75, dis 10 %
Lightning ₩ doz 6.75, dis 10 %
Bay State ₩ doz 13.00, dis 10 %
Climax Corer and Slicer ₩ doz 6.75, dis 10 %

Augers and Bits.
Conn. Valley Mfg. Co.
Douglass Mf. Co.
Ives
Beecher (French, Swift & Co.) dis 50 @ %
Griswold
Nobles Mfg. Co.
Kasson's Patent.
Cook's, Douglass Mfg. Co dis 50& 5 %
Cook's, Ives' dis 45&10 %
Snell Mfg. Co dis 30&10 %
Jennings' Bits dis 10&10 %
Imitation Jenning's Bits dis 30 %
Ives' "Jennings" Bits dis 25 %
Lewis' Single Twist Bits dis 40 %
Andrews Bits dis 50 %
Griswold's Patent Bits dis 30 %
Expansive Bits, Clark's, small, $18; large, $26. dis 20 %
" " Ives $30 @ $30—dis 33⅓ %
" " Blake's $20—dis 40 %
" " Parmelee's small, $20; large, $36 dis 25 %
Hollow Augers Ives' dis 40 %
" " French, Swift & Co.
" " Bonney's Adjust., ₩ doz $48—dis 25&10 %
" " Stearns' Adjust., ₩ doz $48—dis 25&10 %
" " Ives' Expansive ...each $4.50—dis 40 %
" " Univ'sal Expansive, each $4.50—dis 20 %
Gimlet Bits $7.50 ₩ gross, dis 40 %
" Diamond ₩ doz $1.00 dis 25 %
" "Bee" dis 25&10 %
Double Cut Gimlet Bits Shepardson's dis 40 %
" " Ct. Valley Mfg. Co... dis 30&10 %
" " Hartwell's dis 50&10 %
" " Douglass' dis 40 %
" " Ives' dis 40&10 %
Morse's Bit Stock Drill, List of May 15, '78 dis 25 %
L'Hommedieu's Ship Augers dis 15 %
Watrous Ship Augers dis 15 %

Awl Hafts.
Sewing, Brass Ferrule $3.50 ₩ gross—dis 35&10 %
Peg, " 3.50 " dis 35&10 %
Patent Sewing, Short $1.00 ₩ doz—dis 35&10
" " Long $1.40 ₩ doz—dis 10 %
" Peg, Plain Top $10.00 ₩ gross—dis 35&10 %
" " Leather Top 12.00 " dis 35&10 %

Awls, Brad Sets, &c.
Awls Sewing, Common ₩ gross $1.35—dis 25 %
" Sewing, Best ₩ gross 1.40—dis 10 %
" Shouldered Peg ₩ gross 2.25—dis 15 %
" Patent Peg ₩ gross .60—dis 15 %
" Shouldered Brad ₩ gross $2.70—dis 25&10 %
" Handled Brad $8.00 ₩ gross—dis 35&10 %
" Handled Scratch $7.50 ₩ gross—dis 25&10 %
" Socket Scratch $1.00@$1.25 ₩ doz—net
Brad Sets, Aiken's ₩ doz $12.00—dis 40&10 %
" No. 42, $10; No. 43, $12.50 dis 60 %
" Stanley's Excelsior. No. 1, $11.00—dis 25&10 %

Axles.
Common (Guy C. Hotchkiss, Field & Co.) ₩ lb 4¾c
Solid Collar, Case Hardened, Chilled Box ₩ lb 8c
Axle Grease.—Frazer's ₩ lb 6c

Balances.
Light or "Common" dis 25&10 %
All other Spring Balances dis 25 %
Bed Keys.—Gray's Ratchet ₩ doz $4.00, dis 15 %

Bells.
Hand, Light Brass dis. 75 %
" Extra Heavy dis 40&10 %
" White Metal dis 60&5&10 %
" Silver Chime dis 20&10 %
" Swiss dis 25 %
" Globe (Cone's Patent) dis 25&10 %
Gong, Abbe's dis 20&10 %
" Yankee dis 35&10 %
" Barton's dis 40&2 %
Crank, Taylor's dis 25&10 %
" Brook's dis 50 %
" Cone's dis 10 %
" Connel's dis 50&10 %
Lever, Sargent's dis 65&10 %
" Taylor's Bronze or Plated Lever net
" " Japanned Lever dis 25&10 %
" Hart, Bliven & Mead Mfg. Co dis 50&10&2 %
Pull, " " " " dis 50&10&2 %
" Brook's dis 50 %
" Western dis 25&10 %
Call dis 20 %
Cow, Common Wrought dis 20&10 %
" Western dis 20&10 %
" " Sargent's dis 60&10 %
" Kentucky Star" dis 20&10 %
" " Sargent's dis 20&10 %
" Dodge's Genuine Kentucky, new list—
Nos. 0 1 1½ 2 3 4 5 6 Hog
$12.00 10.00 9.00 8.00 6.00 5.00 3.50 2.50 5.00, dis 50 %
" Yaw's Genuine dis 50 %
" Texas dis 40&10 %

Bellows.
Blacksmiths', Common dis 40 %
" Extra and Pittsburgh Pattern dis 20 %
Moulders' dis 25 %
Hand Bellows dis 20 %

Blind Adjusters.—Domestic ₩ doz $3.00, dis 20 %
Blind Fasteners.—Mackrell's dis 30 %
Van Sand's No. 2000, $14.00, dis 25&10 %
" old pattern ₩ gross, $10.50, dis 50&10 %
Washburn's Patent ₩ gross $14.00, dis 30 %
Merriman's new list net

Blind Staples.
Boardman's Patent, ½ in. and larger ₩ lb 25c
" ⅜ in ₩ lb 30c
Harvey's Patent ⅛ & ¼ in. ₩ lb 28c., dis 10 %
" ⅜ in. ₩ lb 34c., dis 10 %

Blocks.—Burr & Co dis 25 %
Differential Pulley Blocks dis 20 %
Tackle, Rope and Iron Strapped (The Penfield B. W.) dis 40 %
Stanley Rule and Level Co dis 33⅓&10 %

Blowers.
Keystone Portable Forge Co dis 20 %

Bolts.
Cast Iron Barrel, Shutter, &c dis 65&10 %
Cast Iron Chain (Sargent's list) dis 65&10 %
Bush's Lever Bolts dis 40, 10&10 %
Spring Butts (Humason & Beckley Mfg. Co.) dis 40&10 %
Wrought Iron Barrel dis 50, 10&10 %
" " Square dis 50, 10&10 %
" " Shutter (Stanley's list) dis 50 %
" " " (Sargent's new list) dis 50, 10&10 %
" " Sunk Flush, Sargent's dis 50&10&10 %
" " " Stanley's dis 15&10 %
" " B.K.Flush, Comm'n, Stanley's dis 30&10 %
" " " Ex. Heavy, dis 20&10 %
" " Plated Knob & Slide Flush " dis 10&10 %
Carriage and Tire, Common 75&3 % cash
" " Norway Iron dis 70 %
" " R. B. & W. (old list) dis 70&5 % cash
" " Philadelphia dis 70 %
" " Coleman dis 60&10 @ 60&20 %
" " Shelton's (old list) dis 70&5 %
Tire, Am. Screw Co dis 70&7½ %
" "Bay State" 75&15 %
Star (Phila) dis 60&10@60&20 %
Union Nut Company dis 70 %
Stove—American Screw Co.'s dis 60 %
" R. B. & W dis 40&10&5 %
" Union Nut Co dis 50 %
Plow dis 50 %
Machine dis 65&10 %
Bolt Ends dis 60
Bolt and Rivet Clippers—Chambers dis 25 %
Borax 12c ₩ lb net

Boring Machines. Upright. Angular.
First quality, no Augers $5.50 $7.50 dis 40&10 %
" with Augers 9.00 11.00 dis 40&10 %
Second quality, no Augers 2.35 5.00 net
" with Augers 4.00 4.65 net
Snell's, no Augers 4.75 6.25 dis 25 %
Phillips' with Augers 10.00 dis 25 %

Bow Pins.
Union Nut Co dis 60&10 %
Hotchkiss' low list dis 10 %
Humason, Beckley & Co.'s dis 60 %
Sargent & Co.'s $19.70 and $21.40, dis 60&10 %

Braces.—Bartier's Patent dis 40&5 %
O. S. Backus dis 60&10 %
Wilson Mfg. Co dis 10 %
Spofford's Patent dis 50&5 %
Noble's Patent dis 40&5 %
Ives' "Centennial" dis 50 %
Common Bal (American) dis 25&10 %

Brackets.—Shelf (Sargent's) dis 60&10 @ 60&10&10%
Swing (T. & S. Mfg. Co.) dis 33⅓ %

Bright Wire Goods dis 75&10 %

Bull Rings.—Union Nut Co dis 50&20 %
Sargent's dis 66⅔&10 %
Hotchkiss' low list dis 10 %
Humason, Beckley & Co.'s dis 60 %
Union Nut Co dis 60&10 %

Butts.
Wrought Brass dis 75 %
Cast Brass, Tiebout's dis 40 %
" Corbin's dis 60&10 %

COMMON CAST, NOT DRILLED.
Fast Joint, Narrow dis 60&10 %
" Broad dis 65&10 %
Loose Joint, Narrow and Broad dis 70&10 %
Parliament Butts dis 65&10 %
Mayer's Hinges dis 70&10 %

DRILLED AND WIRED.
Fast Joint, Narrow dis 50&10 %
" Broad dis 55&10 %
" Broad, Japanned dis 35&10 %
Loose Joint dis 60⅔&10 %
" Japanned dis 62½&10 %
" with Acorns dis 65&10 %
Parliament Butts dis 60&10 %
Mayer's Hinges dis 65&10 %
Loose Pin, no Acorn dis 66⅔&10 %
" Acorns dis 66⅔&10 %
" Japanned dis 70&10 %
" " Plated Tips dis 65&10 %
Union Mfg. Co.'s Fancy Butts—
Figured Enameled Loose Joint dis 65&10 %
Boston Finish, Plain dis 80&10 %
" " with Iron Acorns dis 75&10 %
" " with Silvered Acorns dis 65&10 %

WROUGHT IRON.
Fast Joint Narrow dis 40&10 %
" Lt. Narrow dis 35&10 %
" Broad dis 40&10 %
Loose Joint, Broad dis40&10 %
Table Butts, Back Flaps &c dis 35&10 %
Inside Blind, Regular dis 35&10%
" " Light dis 40&10 %
Loose Pin, Wrt dis 50&10 %
Spring Hinges:
American Spiral Spring Butt Co., Jap'd dis 25 %
" " " " Fancy dis 10 %
Sabin Mfg. Co.'s Double Acting dis 35 %
Centennial, Japanned dis 25 %
" Ornamental dis 20 %
Union Spring Hinge Co.'s dis 25 %
American Spring Hinge Co.'s dis 25 %
Union Mfg. Co dis 25 %
Scovill Brass dis 33⅓&10 %
Blind Butts, Parker dis 70 %
" Palmer dis 40&10 %
" Seymour dis 66⅔&10 %
" Shepard dis 70 %
" Lull & Porter dis 66⅔&10 %
" Nicholson dis 45&10 %
" Huffer dis 40&10 %
" Clark's, Nos. 1, 3, 4, 40 and 50 dis 70 %
" Sargent's dis 70&5&10 %

Butchers' Cleavers.
Humason & Beckley Mfg. Co. dis 30 %
D. R. Barton Tool Co dis 20 %
Bradley's dis 25 %
Beatty's dis 25 %

	2	3	4	5	6	7	8
$16.50	19.00	21.50	24.00	27.00	30.00	33.50	36.50

Hart Mfg. Co. dis 60&10 %

0	1	2	3	4	5	6
$20.00	26.00	30.50	33.00	37.00	41.00	45.00

Can Openers.
Messenger's Comet ₩ doz $3.00, dis 20 %
American ₩ doz $2.25, dis 60 %
Lyman's ₩ doz $3.75, dis 20 %
Poole ₩ doz $3.75, dis 40 %
No. 4, French ₩ doz $2.25, dis 50 %
No. 5, Iron Handle ₩ doz $2.25, dis 60 %
Eureka ₩ doz $2.50, dis 10 %
Sardine Scissors ₩ doz $7.00, dis 45 %
Star ₩ doz $4.00, dis 25 %

Caps—Percussion, ₩ 1000.
Hicks & Goldmark's G. D. & S. R. 35c
" " E. B. 1-10 Ground 70c, dis 5 %
" " E. B. 1-10 Turned 65c, dis 5 %
" " D. W. P. 1-10 $1.40, dis 5 %
" " D. W. P. 14 1.35, dis 5 %
" " Colt's 1-10 70c, dis 5 %
Ely's E. B. 1-10s, 65 @ 68c. gold
" Double Waterproof, 1-4s, $1.50; 1-10s, $1.58c, gold
Colt's 1-10s, 80c gold

Cartridges.—Metallic dis 60&7 %
Cards.—Horse and Curry dis 33⅓&10 %
Cotton dis 20&10 %
Wool dis 20&10 %

Carpet Stretchers.
Cast Steel, Polished ₩ doz $5.00, dis 30 %
" Iron, Steel Points ₩ doz $2.00, dis 45&5 %

Casters.
Bed dis 55 %
Plate and Shallow Socket dis 55 %
Deep Socket dis 40 %

Cattle Leaders.
Hotchkiss' Sons' dis 10&10 %
Humason, Beckley & Co.'s dis 60 %
Sargent's dis 60&10&10 %
Union Nut Co dis 60&10 %

Chain.
Trace, ⅝-1-2 by the cask, ₩ pair 45 @ 46c
" ⅝-10-3 by the cask, ₩ pair 43 @ 44c
" 7-10-2 by the cask, ₩ pair @ 40c
German Halter Chain dis 30&5 % gold
" Coil dis 30&5 % gold
Galvanized Pump Chain ₩ lb 10½c dis 10 %
Jack Chain, Iron dis 60&5 %
" Brass dis 50&5 %

Chalk.
White ₩ gross 55c net
Red ₩ gross 75c net
Blue ₩ gross 90c net
White Crayons ₩ gross 73½c net

Cherry Stoners.
"Family" ₩ doz $6.75 dis 11 %

Chisels.
D. R. Barton Tool Co. (all kinds) dis 20 %
Socket Framing, Crossman dis 65&10&2 %
" " Buck Bros. new list, dis 25 %
" " Hart Mfg. Co. dis 65&10&2 %
" " Merrill dis 60&10 %
" " Witherby Tool Co dis 60&10 %
" " Douglass' dis 70 %
" Firmers, Crossman dis 65&2 %
" " Buck Bros new list, dis 25%
" " Hart Mfg. Co., extra dis 65&10&2 %
" " Merrill dis 60&10 %
" " Witherby Tool Co dis 60&10 %
" " Douglass' dis 70&5 %
" Corner dis 65&70 %
Tanged Firmers extra dis 40 %
" " Butcher's $3.00 @ $5.25 to £ gold
" " Newbould's 5.50 to £ gold
" " Spear & Jackson's 5.00 to £ gold
" " Buck Bros (Shank) 5.00 to £ gold

Clamps.
Iron, Providence Tool Co.'s, Wrt. Iron dis 25 %
" Adjustable, Gray's dis 20 %
" " Lambert's dis 20 %
" " Snow's dis 40&5 %
" " Hammer's dis 15 %
" " Stearns' dis 15&10 %
" Cabinet, Sargent's dis 60&10&10 %
" Carriage Makers', Sargent's dis 60&10&10 %
" Cord and Tape (T. & S. Mfg. Co.) dis 30 %

Clips, Axle.
Norway or Best dis 60 %
Superior dis 60& 10 %
Cockeyes....1¼ in., 28c.; 1¾ inch, 33c.; 1¾ in., 37c. net
Cocks, Brass.
Racking, L. F. & C. list dis 50 %
" Peck Bros. list dis 55 %
Globe dis 50 %
Plain Bibbs dis 50 %
Ale and Beer, L. F. & C. list dis 20&10 %
" " Peck Bros. list dis 50 %

Coffee Mills.
Board and Box dis 20&21 %
Increase Wilson's net
Selsor's Pat $9.50, $10.50, dis 25 %
American (Enterprise Mfg. Co.) dis 20 %
French Steel dis 20 %
The Swift (Lane Bros.) dis 25 %

Compasses, Dividers, &c.
Compasses dis 35&10 %
Callipers dis 30&10 %
Dividers dis 55 %
Bemis & Call Co.'s Dividers dis 35&10&33⅓ %
Bemis & Call Co.'s Compasses & Callipers dis 35&10&10 %
Cook's dis 15 %
Excelsior dis 40 %
Miller's Patent dis 25 %

Coopers' Tools.
Bradley's dis 15 @ 20 %
D. R. Barton Tool Co dis 20 %

Corkscrews.—Humason & B dis 33⅓ %
Corn Knives and Cutters.—Bradley's dis 10 %
Crow Bars.
Cast Steel ₩ lb 9c net
Iron, Steel Points ₩ lb 5c

Crucibles.—Gautier & Co ₩ No. 51c

Curling Irons, &c.
⅛, ⅝, ¾ in., $1.80, 2.00, 2.40 dis 10 %
Curling Tongs ₩ doz $4.25, dis 10 %
Pinching Irons ₩ doz 7.50, dis 20 %

Curry Combs.
Curry Comb Mfg. Co dis 25&10
Fitch's (List of No. 240, $1) dis 33⅓&10 %
Hotchkiss'& Kellogg's, Iron & Brass, old list dis 40&7½ %
Hotchkiss' Novelty dis 20&10 %
Rubber ₩ doz $9.00, dis 20&10 %

Curtain Pins.—Silvered Glass dis 15 %
White Enamel dis 15 %

Cutlery.
Meriden Cutlery Co. (Table) net
Am. Miller Bro.'s Cutlery Co dis 25 %
Humason & Beckley, Pocket dis 25 %
Naugatuck Cutlery Co. list net
New York Knife Co. (Pocket) dis 35&25 % cash
" (Table) net

Dippers.
Britannia ₩ doz $3.75 @ $4.25, net
Cocoa, Plain ₩ doz $3.25, dis 20 %
" Rimmed ₩ doz 5.75, dis 20 %

Dog Collars.
Embossed Gilt dis 20 %
Leather dis 30 %
Brass dis 25 %

Door Springs.
Torrey's Rod ₩ doz $2.00 net
Gray's " ₩ doz $1.65, net
Johnson's Rod ₩ doz 3.00, net
Gem (Coil)—
No. 1, Large, Japanned ₩ doz $3.50
No. 2, Medium, " ₩ doz 2.50 } dis 10 %
No. 3, Small, " ₩ doz 2.00
Challenge (Coil)— Nos. 9 7 6
Japanned ₩ doz $2.00 2.50 3.50
Coppered ₩ doz 4.00 4.50 5.00 } dis 15 %
Galvanized ₩ doz 3.50 4.00 4.50
Nickeled ₩ doz 5.50 6.00 7.00
Premium (Coil)— Nos. 1 2 3
Japanned ₩ doz $7.40 6.25 5.00
Nickeled " doz 11.00 9.50 8.00 } dis 30 %
Star (Coil)—For Cop'd, Nickel-Plated, &c., see list.
No. 4 ("Shoo Fly") Screen door size ₩ doz $1.80
No. 5, Screen Door Size ₩ doz $2.00
No. 6, Medium ₩ doz 2.50 } dis 25 %
No. 7, Large ₩ doz 3.50
Sabin's Lever No. 1, $1; 2, $1.50; 3, $2; 4, $2.50; dis 30 %
Sabin's Boss ₩ doz $4.20, dis 40&10 %
Philadelphia 5 in., $5.00; 8 in., $7.00, dis 35 %
Barker's Concealed dis 20 %
Cowell's No. 1, $18.00; No. 2, $15.00 ₩ doz, dis 50 %
Rubber complete ₩ doz $1.50, net

Drawing Knives.
Crossman's No. 1 dis 65&1 %
D. R. Barton Tool Co. dis 20 %
Hart Mfg. Co., extra dis 65&10&2 %
Merrill dis 60&10 %
Nobles Mfg. Co. dis 15 %
Bradley's dis 35 %
Adjustable Handle dis 20 %
Witherby Tool Co. dis 60&10 %
Douglass' dis 70 %

Drills and Drill Stocks.
Blacksmiths' each $2.15 net
" Self-Feeding each $7.50, dis 10 %
Breast, P. S & W. dis 25 %
Breast, Hotchkiss dis 10 %
" Wilson's ₩ doz $7.20, dis 60&10 %
" Miller's Falls each $2.50, dis 25 %
Ratchet, Merrill's dis 20 %
" Ingersoll's (old list) dis 35 %
" Whitney's dis 30 %
" Weston's dis 20 %
" Moore's Triple Action dis 20 @ 25 %
Whitney's Hand Drill dis 20&10 %
Wilson's Drill Stocks dis 10 %
Automatic Boring Tools each $2.75, dis 20 %

Drill Chucks.—Morse's Beach Patent dis 30 %
" Adjust. each $10.00, dis 20 %
Danbury $8.00, dis 30 %

Egg Beaters.
Dover ₩ doz $5.00, dis 20 %
Family ₩ doz $3.00 net
National ₩ doz $4.50, dis 33⅓ %
Schofield ₩ doz $3.50

Elevator Buckets.
Mill E. Buckets, light, 5 to 10 inches, (Duc's Improved) ₩ 100 $23.00 @ $54.00, net
Mill E. Buckets, heavy, 5 to 10 inches (Duc's Improved) ₩ doz $5.50 @ $10.20, net

Emery.
Genuine Chester—Regular Nos. ₩ lb 5 c } net
" " Flour and FF ₩ lb 5½c }
Washington Mills—Regular Nos. ₩ lb 8c
" Flour ₩ lb 5c
Wellington Mills, Grain ₩ lb 10c net
" Flour ₩ lb 8c net
Hampden Emery Grain 5c net
" Flour 3c net

Enameled and Tinned Ware.
Kettles dis 40 @ 50 %
Sauce Pans dis 30 @ 35 %
Tinned Sauce Pans dis 30 @ 35 %

Escutcheons.
Door Lock Same discounts as Door Locks
Brass Thread dis 60&10 %
Wood dis 25 %

Faucets.
Fenn's dis 50 %
Fenn's Cork Stops dis 40 %
Star dis 65&10 %
Frary's Patent Petroleum dis 20&10 %
Wood and Metallic dis 40 %
Metallic Key, Leather Lined dis 30&10 %
Cork Lined dis 65&10 %
Enterprise (Self Measuring) ₩ doz, $36.00, dis 20 %

Felloe Plates.
₩ lb 14c, dis 50 %

Files.
American File Co. $5.00 to £ currency, dis 30@35 %
Auburn $4.00 to £ currency, dis 25 %
Arcade $5.00 to £ currency, dis 30 %
G. & H. Barnett dis 25 %
Nicholson (Nicholson List) dis 35 %
Heller & Bros. $5.00 to £ currency, dis 20 %
Madden & Cockayne File Co. $5.00 to £ cur., dis 25 %
Jowitt's $4.50 to £ gold
J. & Riley Carr 4.50 to £ gold
Stubs' $7.00 @ 7.50 to £ gold
Butcher's 4.50 to £ gold
Walter Spencer & Co.'s "Diamond" 4.50 to £ gold
Fisher's 4.75 to £ gold
Moss & Gamble 4.50 to £ gold
H. Disston & Sons (new list) dis 35 %
Limet & Co. (French) $4.25 to £ gold
Boynton's Cant dis 40 %

Fluting Machines.
Knox, 4-inch Rolls $2.10 each net
" 6 " " $2.50 each net
" 8 " " 4.40 each net
Peerless, 4-inch Rolls 4.00 each net
" " " 4.75 each net
Eagle, 3½-inch Roll $30 00 ₩ doz, dis 45 %
" " " 40.00 ₩ doz, dis 45 %
Empire $4.00 each net
Eureka, No. 1, 7-inch Roll 6.75 each net
" No. 2, 5-inch Roll 5.00 each net
Crown, 4½-in. Roll, $4; 6-in., $4.75; 8-in., $7.25 each, dis 45 %
Champion, 4-in., $2.15; 6-in., $2.50; 8-in., $4.00 each, net
Domestic Fluter 1.50 each net
Geneva Hand Fluter $15.00 ₩ doz, dis 10 %
Combined Fluter and Sad Iron ₩ doz 15.00, dis 10 %

Fluting Scissors dis 40&10 %

Forgers.
"Empire" dis 20 %
Keystone Portable Forge Co dis 20 %

Forks.
Hay, Manure and Spading new list, dis 15 %
Plated A 1, Rogers & Bro. dis 40&5 % cash
" Reed & Barton dis 40&5 %

Fruit and Jelly Presses.
Enterprise Mfg. Co dis 20 %

Fry Pans.
Burnished, P. S. & W., new list dis 60 %

No.	0	1	2	3	4	5	6	7	8
₩ doz.	$3.00	$3.75	4.25	4.75	5.25	6.00	7.00	8.00	9.00

Gauges.
Marking dis 45&10 %
" Star dis 35 %
Wire dis 10 %
" Smith's Patent ₩ doz $18.00, dis 40 %

Gimlets.
Nail and Spike dis 40@45 %
"Bee" Gimlets ₩ gross $12.00, dis 45 %
"Eureka" Gimlets dis 40 %
"Diamond" Gimlets dis 20&10 %
Double Cut, Shepardson's dis 40 %
" " Hartwell's dis 50 %
" " Ives' dis 40&10 %
" " Douglass' dis 40 %

Glue Pots.
Tinned and Enameled dis 40 %
Family, Howe's "Eureka" dis 25 %
" L. F. & C.'s "Handy" dis 25 %

Grindstone Fixtures.
Sargent's Patent dis 70&10&10 %
Reading Hardware Co dis 40&10 %
" "Keystone" dis 45&10 %
Hart Mfg. Co., Nos 9 to 11 dis 50&10 %
Rick Bros. dis 45&5 %

Hammers.
Maydole's (new list on A. E. Bell Face) dis 15 %
Humason & Beckley Mfg. Co dis 33⅓ %
Cheney's Steel Face and Claw dis 10 %
" all Steel dis 20&10 %
Verree dis 5 %
Magnetic Tack dis 25&10 %
Warner & Noble's dis 10 %

Hand Cuffs and Leg Irons.
Providence Tool Co.'s Hand Cuffs, $15.00 ₩ doz } dis 10 %
" " Leg Irons, $25 ₩ doz }
Tower's dis 25 %

Handles.
Door or Thumb Latches—
Nos. 0 1 2 3 4
Per doz. $0.80 1.00 1.18 1 35 1.50 dis 65&10 %
Roggin's Latches 33c net
Bronzed Iron Drop Latches ₩ doz $0.85 @ $1.10 net
Jap'd Store Door Handles—Nuts, $1.40; Plate $1.95 no Plate, 75c net
Barn Door per doz $4.00, dis 65&10&10 %
Wrought Chest dis 60&10 %
Surface Chest, Sargent's list dis 60&10&10 %
Flush Chest dis 60&10&10 %
Lifting dis 60&10 %
Saw and Plane dis 35&10 %
Boynton's X Cut (Loop) dis 20 %
" (Centennial) dis 15 %
Hammer and Hatchet dis 20 %
North Carolina Handle Co dis 20 %
Brad Awl ₩ gross $3.75, dis 20&10 %
Hickory Firmer Chisel, assorted, ₩ gross $5.25
" " " large, " 6.50
Apple " " assorted, " 6.00
" " " large, " 7.50
Socket " " assorted, " 4.50 } dis 40 %
" Framing " assorted, " 7.00
File, assorted, ₩ gross 3.50
Auger, assorted, ₩ gross 6.00
" large, " 7.00
Patent Auger, Ives' dis 25&10 %
" Douglass' ₩ set $1.25, dis 10 %
" Swan's ₩ set $1, dis 20&10 %

Hangers.
Anti-Friction dis 50&5 %
Barn Door dis 70&10 @ 75&10 %
Novelty dis 40 %
Challenge dis 50 %
Climax (Anti-Friction) dis 50 %
Sterling Improved (Anti-Friction) dis 70&10 %
Cheritree dis 20 %

Harness Snaps.
Henshaw's List of 1¼ changed to $14.00, dis 50 %
Judd's " " " 14.00, dis 50&10 %
Fitch's (Bristol) " 14.00, dis 50 %
Hotchkiss' dis 10 %
Andrews' dis 50 %
Sargent's dis 60&10 %
New York Wire dis 20&10 %
"German" dis 60 %

Hatchets.

Isaiah Blood			dis 15 %
Shingling, Nos. 1 2 3	₩ doz $7.25	$8.00	$8.75
Claw, Nos. 1 2 3	" doz 7.75	8.50	9.25
Lathing, Nos. 1 2 3	" doz 7.50	8.00	8.50
Hunt's			dis 25 %
Shingling, Nos. 1 2 3	₩ doz $7.25	$8.00	$8.75
Claw, Nos. 1 2 3	" doz 7.75	8.50	9.25
Lathing, Nos. 1 2 3	" doz 7.50	8.25	9.00
Hurd's			dis 30&10 %
Shingling, Nos. 1 2 3	₩ doz $8.00	$8 50	$9.00
Claw, Nos. 1 2 3	" doz 9.00	9.50	10.00
Lathing, Nos. 1 2 3	" doz 8.00	8.50	9.00
Simmon's			dis 35 %
Shingling, Nos. 0 1 2 3	₩ doz $7.50	$8.00	$8.50
Claw, Nos. 1 2 3	" doz 9.00	9.50	10.00
Lathing, Nos. 1 2 3	" doz 8.00	8.50	9.00
Broad, Nos. 1 2 3 4	" doz 9.00	10.00	12.00
Nos. 5 6 7 8	" doz 16.00	18.00	20.00
Collins'			dis 10 %
Shingling, Nos. 1 2 3	₩ doz $6.00	$6.50	$7.00
Claw Nos. 1 2 3	" doz 6.50	7.00	7.50
Lathing, Nos. 1 2 3	" doz 6.00	6.50	7.00
D. R. Barton Tool Co.			dis 20 %
Shingling, Nos. 1 2 3	₩ doz $11.00	$10.50	$10.00
Lath, Nos. 1 2 3	" doz 10.50	10.00	9.50
Half Hatchets, Nos. 1 2 3	" doz 11.00	10.50	10.00
M. H. Jones & Co.			dis 40 %
Shingling, Nos. 1 2 3	₩ doz $8.00	$8.50	$9.00
Half Hatchets, Nos. 1 2 3	" doz 8.00	8.50	9.00
Claw, Nos. 1 2 3	" doz 9.00	9.50	10.00
Lathing, Nos. 1 2 3	" doz 8.00	8.50	9.00
Broad, Nos. 2 3 4	" doz 11.00	12.00	24.50
" Nos. 5 6 7	" doz 16.50	18.00	19.50

Hay Knives.
"Lightning" ₩ doz $20.00 net
Wadsworth's dis 50 %

Hinges.
Gate, Western ₩ doz $6.25, dis 60&10 %
" N. E. ₩ doz $10.13, dis 60&5&10 %
" N. E. Reversible ₩ doz $6.50, dis 60&10 %
Gate, Clark's No. 1 ₩ doz $6.00, dis 50 %
" N. Y. State ₩ doz $7.20, dis 60&10 %
" Automatic ₩ doz $12.50 dis 20&10 %
" Common Sense dis 20 %
" Seymour's dis 40&10 %
Rolled Blind Hinges dis 60&10 %
Rolled Plate dis 70&10 %
Rolled Raised dis 70&10 %
Wrought Strap and T, list Dec. 20, '77 dis 60&10 %
Plate Hinges ⅝ to 10 in. 5½c ₩ lb } dis 10 %
"Providence"... over 10 in. 4½c ₩ lb }
Screw Hook and Strap... ⅝, 10, 12 in., 11c } dis 40&10 %
14 to 36 in., 9½c }
Heavy Welded Hook... ⅝ to 12 in., 11 c } dis 30 %
14 in. & up, 9½c }
Screw Hook and Eye... ⅝ in. 11½c } net
⅞ in. 13 c }

Hoes.—Solid Shank, C. S. ₩ doz $5.25, dis 15 %
Socket ₩ doz 5.75, dis 15 %
Riveted Eye ₩ doz
Grub dis 30 %
Planters' dis 35 @ 40 %
Scovill Pattern dis 25 @ 30 %
Handled Solid C. S. Shank dis 35 %
Planters', Handled dis 35 %
Scovill Pattern, Handled dis 35 %
Hick's Pat. Solid C. S. Planters' dis 20&10 @ 30 %
" " " Scovill Pattern dis 20&5 @ 25 %

Hooks.
Bird Cage, Sargent's list dis 60&10c&10 %
Cotton dis 50 %
Cotton (Humason & Beckley Mfg. Co.) dis 25 %
Belt dis 20 %
Bench—Hotchkiss' $5.00 ₩ doz dis 10 %
" Weston's, No. 1, $10.00; No. 2, $9.00 ₩ doz dis 25 %
" McGill's, $3.00 ₩ doz dis 10 %
" Skinner's, $6.25 per doz dis 20 %
Clothes Line, Hart's list dis 60&10&5&10 %
" Sargent's list. dis 66⅔&10 %
" Reading list dis 33⅓&5&10 %
Ceiling Hart's list dis 70&10 %
Harness Sargent's list dis 70&10 %
" Reading list dis 40&10 %
Tassel (T. & S. Mfg. Co.) dis 40 %
Wrought Staples and Hooks and Staples dis 75 %
" Staples, Stanley's list dis 40 %
Wire Screw Hooks and Eyes dis 75&10 %
Grass and Bush dis 40 %
Whiffletree—Patent dis 40 %
Hooks and Eyes—Malleable Iron dis 60&10&10 %
" " Brass dis 60&10&10 %

Horse Nails.

	Nos. 5	6	7	8	9	10	
Ausable ₩ lb	30c	27c	25c	24c	23c	22c	dis 20 %
" Finished, Polished or Blued	31c	28c	26c	25c	24c	23c	

Bridgewater Iron Co. (Nos.	5	6	7	8	9	10
Pointed and Polished)	26c	23c	21c	20c	19c	18c
Nos.	5	6	7	8	9	10
Cortland	29c	26c	24c	23c	22c	21c } dis 15
" P't'd & Blued	31c	28c	26c	25c	24c	23c } @ 25 %

Globe (New list)..) Nos.	5	6	7	8	9	10	
)	26	23	21	20	19	18c	net
North Western Fin'h'd	26	23	21	20	19	18c	net
" " Plain	25	22	20	19	18	17c	net
National. Pointed and Polished, Pat. Fin		25	23	22	21	20c	net
Putnam Hammer, P't'd	26	23	21	20	19	18c	net
Vulcan P't'd & Blued	26	23	21	20	19	18c	net

Horse Shoes.—Burden ₩ keg $5.37½
R. Horse Shoe Co., Perkins' Improved Light, Medium and Heavy ₩ keg 3.37½
Mule Shoes ₩ keg 4.87½
Perkins' Snow ₩ keg 4.87½

Ice Awls, Chisels, &c.
American Ice Chisel ₩ doz $6.50 net
National " ₩ doz $6.25, dis 20 %
Novelty Ice Breakers ₩ doz $6.25, dis 20 %
White's Sliding Head Picks ₩ doz $2.50 dis 40 %
Dunlap's Ring Picks ₩ doz 3.00, dis 25 %
Wood Head Picks, Sargent's ₩ doz $1.8.. dis 60&10 %
Iron ₩ doz 1.85, dis 60&10 %
Ice Mallets, Pickin Head ₩ doz $1.75 net
" Pick in Handle ₩ doz 3.00 net
Ice Axes, Small Cast or Malleable ₩ doz 1.25 net
Kitchen Ice Tongs ₩ doz 2.25 net
Combination Ice Tools ₩ doz $2.50, dis 30&10 %

Kettles.
Brass, 7 to 13 inches inclusive ₩ lb 35c net
Brass, larger than 13 inches ₩ lb 40c net
Enameled dis 60 %

Knives.
Ames' Butcher Knives dis 20 %
" Shoe dis 15 %
" Bread ₩ doz $1.50, dis 15 %
Hay and Straw—'Wadsworth's" See Cutlery
Table and Pocket

Knobs.
Carriage (Jap'd 80c.

Universal Family.....dis 25 %
Favorite Family.....dis 25 %
Scale Beams, Chatillon's list.....dis 25 %
" Sargent's list.....dis 60&10 %

Scrapers.
Box, 1 Handle.....₩ doz $5.00, dis 10 %
" 2 " ₩ doz 6.00 dis 10 %
Defiance Box and Ship.....dis 25&10 %
Foot.....dis 60&10 %
Ship (common).....per doz $3.00 net
" (Providence Tool Co.....dis 10 %

Screw Drivers.
Hart, Bliven & Mead, new list.....dis 40&10 %
Douglass Mfg. Co.....dis 35&10 %
Disston's.....dis 45 %
Disston's Patent Excelsior.....dis 60 %
Buck Bros.....dis 25 %
Stanley Rule & Level Cos., Black Handles...dis 35&10 %
" " " Varnished H'le..dis 45&10 %
Sargent & Co.'s.....dis 60&10 %

Screws.
Flat H'd Iron list Sept. 1, '75.....dis 45 %
Round Head Iron " " .....dis 45 %
Flat Head Brass, list Sept. 1, '75.....dis 50 %
Round Head Brass. list Sept. 1, '75.....dis 35 %
Brass and Silver Capped.....dis 40 %
Japanned, list of Plain Screws.....dis 45 %
Lag or Common Coach.....dis 65 %
Coach, Patent Gimlet Point.....dis 40 @ 45 %
Bed.....dis 10 %
Machine, Flat Head, Iron, Am. Screw Co.....dis 25 %
" Round Head, Iron, " " .....dis 20 %
Bench, Iron.....dis 55&10 %
" Wood, Beach.....₩ doz $3.00, net
" " Hickory.....dis 20&10 %
Hand.....dis 25&10 %
Hand Rail, Sargent's.....dis 60&10 %
" " Humason, Beckley & Co.'s.....dis 40&10 %
Jack, Bell Bottom.....dis 20 %
Jack (Wilson's).....dis 30 %
Sash (T. & S. Mfg. Co.).....dis 25 %

Scythes.
Blood German Steel, Grass...₩ doz $10.00
" Cast, " " ...₩ doz 11.00
" Silver " " ...₩ doz 12.00
" German " Grain...₩ doz 14.00
" Cast " " ...₩ doz 15.00
" Excelsior and Granger..₩ doz 11.00
" Young America..10.50
" Silv Clipper..13.00
(dis $1.50 from list)
Wadsworth's Grass.....dis 40 %
" Bush.....dis 20 %
Scythe Snaths.....dis 25

Shears and Scissors.
Cast Steel.....dis 75 & 10 %
" Iron, "American".....dis 45&5 %
Seymour's Straight Trimmers.....dis 65 %
" Scissors.....dis 65 %
Pruning.....₩ doz $4.75 @ $6.50 net
Barnard's Lamp Trimmers.....₩ doz $3.75
Tinners'.....dis 20 %

Sheep Shears.
Ball's Pat. Solid Steel Bent.....gold, net

Inches	5	5½	6
Per doz	$8.25	$8.75	$9.25

Sheaves.
Sliding Door, M. W. & Co., list.....dis 35&10&2 %
" R. & E. list.....dis 50&2 %
" Patent Roller.....dis 25&2 %
" " Hatfield's.....dis 50&2 %
" Russell's Anti-Friction.....dis 50&2 %
Sliding Shutter, R. & E. list.....dis 50&2 %
" " Sargent's list.....dis 55&10 %
Moore's Anti-Friction.....dis 45 %

Shovels and Spades.
Ames.....dis 33⅓ %
" not stamped "Ames".....dis 37½ %
Rowland's.....dis 50 %
Kimball Shovel Co.....dis 20 @ 20&5 %
Old Colony.....dis 30 %
Middleboro' Shovel Co.....dis 30 %
Remington's (Lowman's Patent).....dis 30 %
Dunning's Shovels and Scoops.....dis 20&7½ %
B. Rowland & Co., Anchor Brand.....dis 50 %
" " Patent.....dis 40 %
Oxford Patent.....dis 40 %

Shovels and Tongs.
Iron and Brass Head, R. & E. list.....dis 50&2 %
" " Hart's.....dis 50&10&2 %
Polished Steel.....dis 50&2 %

Slates.
Square Frames, Round Cornered, by case.....dis 70 %
Less than a case.....dis 65&10 %

Spoke Shaves.
Defiance Metallic.....new list, dis 25&10 %
Iron.....dis 33⅓&10 %
Wood.....dis 30 %
Bailey's.....dis 25&10 %

Spoke Trimmers.
Bonney's.....₩ doz $10.00, dis 40 %
Stearn's.....₩ doz $10.00, dis 40 %
Ives'.....No. 1, $15.00; No. 2, $12.00 ₩ doz, dis 40&10 %
Douglass'.....₩ doz $9.00, dis 20&10 %

Spoons.
Tinned Iron.....dis 15 %
Basting.....dis 30 %
Britannia.....dis 60 %
Derby Silver Co.....dis 40&5&5 %
L Boardman's Sons, A1.....dis 40&5&5 %
Rogers & Bro., A 1.....dis 40&5 % cash
Reed & Barton.....dis 40&5 %
Rogers Cutlery Co.....dis 40&5&5 %
Hall & Elton.....dis 40&5 %
Holmes, Booth & Haydens.....dis 40&5 %
German Silver (Hall & Elton).....dis 30&5 %
German Silver (L. Boardman's Sons).....dis 30&5 %
Diamond Steel (L. Boardman's Sons).....dis 30&5 %
Tin (P. S. & W.), Teas.....$1.50 ₩ gross, net
" Tables.....$2.50 ₩ gross, net
Tin Cowles Hdw. Co.).....dis 10 %
" " " case lots.....dis 20 %

Stocks and Dies.
Stone.
Hindostan Stone.....₩ ₤ 6c
" Ax Stone.....₩ ₤ 8c (dis 90&10 %)
" Slips.....₩ ₤ 10c
Sand Stone.....₩ ₤ 6c, dis 30&10 %
Washita Stone (Boyd & Chase).....No. 1, ₩ ₤ 25c
" " " .....No. 2, ₩ ₤ 20c
" Slips, " .....No. 1, ₩ ₤ 50c (dis 10 % from list)
Arkansas Stone, " .....No. 1, ₩ ₤ $1.35
" Slips, " .....No. 1, ₩ ₤ $2.50
Turkey Oil Stone.....4 to 8in, $1.00 ₩ ₤, dis 10 %
" Slips.....$2.50 ₩ ₤, dis 10 %
Grindstones, Family, Loring's.....dis 10 %

Stove Polish.
Joseph Dixon's.....₩ gross $6.00, dis 5 %
Gem.....₩ gross $4.50, dis 5 %
Ruby.....₩ gross $3.75, net
Gold Medal.....₩ gross $6.00, dis 25 %
Rising Sun.....₩ gross $5.75, net

Squares.
Steel.....dis 50 %; full cases, dis 50&10 %
Iron.....dis 50 %; full cases, dis 50&10 % (2 % cash)
Nickel Plated.....add $2.40 @ $4.00 ₩ doz, net
Try Squares and T Bevels.....dis 45&10 %
Star Try Squares and Bevels.....dis 35 %
Disston's Try Squares and T Bevels.....dis 45 %
Winterbottom's Try and Mitre.....dis 20&10 %
Bailey's Try Squares and T Bevels.....dis 25&10 %

Tacks, Brads, &c.
List of May, 1878.....dis 50 %
Double-Pointed Tacks.....dis 40&5 %

Tap Borers.
Common and Ring.....dis 20&10 %
Ives' Tap Borers.....dis 10&10 %
Enterprise Mfg. Co.....dis 20 %

Tapes, Measuring.
American Flask and Cap Co.....dis %
Eddy's.....dis 5 %
Spring Tapes.....dis 25&10 %

Thermometers.
Tin Case.....dis 60&10&10 %

Tobacco Cutters.
Enterprise Mfg. Co. (Champion).....dis 20 %
Wood Bottom.....₩ doz $12.00, dis 30&10 %
All Iron.....₩ doz $10.50, dis 40&5 %
Nashua Lock Co.'s.....₩ doz $18.00, dis 50 %

Toe Calks.—Winsted.....₩ ₤ 10c. dis 10 %

Tinners' Tools and Machines.
Machines (P. S. & W.).....dis 5@10 %
Tools (P. S. & W.).....dis 15@20 %

Traps.
Game, Newhouse.....dis 30 %
" Newhouse Pattern.....dis 50 %
" Blake's Patent.....dis 40&10 %
Mouse, Wood, Choker.....₩ doz holes, 13½c
" Patent Choker (Union Nut Co).....₩ doz holes, 16 @ 18c, net
" Round Wire.....₩ doz $1 50, dis 10 %
" Cage " ₩ doz $2.50, dis 10 %
" Patent Self Setting.....₩ doz holes, 25c, net
" Catch-em-alive.....₩ doz $3.50, dis 10 %
Rat, "Decoy".....per doz $10.00, dis 10 %

Trowels.
Lothrops Brick and Plastering.....dis 10 %
Disston's Brick and Plastering.....dis 20 %
Peace's Plastering.....dis 20 %
Clement & Maynard's.....dis 20 %
Rose's Brick.....dis 15 %
Brades' Brick.....gold, dis 20 %
Worrall's Brick and Plastering.....dis 20 %
Garden.....dis 40 %

Trier.
Butter and Cheese.....dis 25 %

Tuyere Irons.
Vulcan Pattern.....$3.50 each, net

Vises.
Solid Box, Trenton.....40 to 160 lbs.. 12½c, net
" Wilsons.....32 to 160 lbs., 10c, net
" "Crown" (A. H. Hildicks) 40 to 100 lbs., 15c currency, dis 20 %
" Peter Wrights.....15½c, gold
Parallel, Parker's.....dis 20 %
" Wilson's.....dis 50 %
" Howard's.....dis 25 %
" Sargent's.....dis 60&10 %
" Trenton.....dis 25 %
" Backus and Union.....dis 25 %
" Merrill's.....dis 15 %
" Fisher & Norris.....dis 15&10 %
" Buffalo.....dis 25 %
" Stevens'.....dis 25 %
" Simpson's Adjustable.....dis 25 %
Saw Filers, Bonney's.....₩ doz $4.00, dis 20&10 %
" Stearn's.....dis 20&10 %
" Hopkins'.....₩ doz $17.40, dis 10 %
Lowell Hand Vises.....dis 20 %

Ventilators.
Protective (upper) per foot, $1.00.....
" (lower) " 1.50.....
(dis 25 %)

Washer Cutters.
Smith's Patent.....₩ doz $12.00, dis 10 %
Johnson's.....₩ doz $12.00, dis 25 %
Penny's.....₩ doz $14.00 and $16.00, dis 20&10 %
Appleton's.....₩ doz $8.00, dis 10&10 %

Washers.—See Nuts and Washers.

Weather Strips.
Protective Ventilator Co.'s.....dis 25 %
Well Wheels.—Revised list.....dis 60&10 %

Wire.
Brass and Copper.....List of Jan. 1, 1878 dis 10 %
Bright and Annealed.....Nos. 0 @ 18, dis 55 @ 57½ %
" " .....Nos. 19 @ 26, dis 50 @ 52½ %
" " .....Nos. 27 @ 36, dis 60 @ 62½ %
Coppered.....Nos. 0 @ 18, dis 40 @ 52½ %
Galvanized, Nos. 0 to 6.....₩ ₤ 10c, dis 30 @ 35 %
" Nos. 7 to 18.....market list, dis 30 @ 35 %
Tinned, Nos. 0 to 18.....dis 45 @ 47½ %
Cast Steel.....dis 25 @ 30 %
Tinned Broom Wire, Nos. 18 to 25.....dis 47½ @ 50 %
Annealed Fence, Nos. 8 and 9.....dis 55 @ 57½ %
" Grape, Nos. 10 to 14.....dis 55 @ 57½ %
Galvanized Telegraph, Nos. 7 to 9.....₩ ₤ 8½c
" " Nos. 10 and 11.....₩ ₤ 9½c
" " No. 12.....₩ ₤ 10c
Fence Staples.....₩ ₤ 7 @ 7½c
" Staples, Galvanized.....₩ ₤ 9½ @ 10c
Stubs Steel Wire.....$7.00 to £ gold
Japanned Barb Fence.....₩ ₤ 15c
Galvanized " .....₩ ₤ 16c
Sz sel Music Wire, Nos. 12 to 27.....₩ ₤ $1.00, net
Judd's Picture Wire.....dis 60&20 %
Clothes Line Wire, Galvanized.....₩ coil 35 @ 43c net

Wire Cloth.
Clinton, green or drab, by the roll, per sq. ft. 3¼c net

Wrenches.
American Adjustable.....dis 45 %
Baxter's Adjustable "S," " Diagonal.....dis 20 %
Collins & Co.'s.....dis 45 %
Coes' Genuine.....dis 50&10 %
" Pattern (Wrought).....dis 60&10 %
" " (Malleable).....dis 75&10 %
Girard.....dis 50&10&10 %
Lindsay's " .....dis 25 %
Taft's Pattern.....dis 75&10 %
Davis' Patent Duplex.....new list, dis 25 %
Bemis & Call's Patent Combination.....dis 25 %
" " Merrick's Pattern.....dis 25&25&20 %
" " Briggs' Pattern.....dis 25&10 %
" " Cylinder or Gas Pipe.....dis 25&30 %
Aiken Pocket (Bright).....$8.00, dis 50&10 %

Wringers. Per doz.
Universal, Cog Wheels, No. 2.....$60.00
" " No. 2.....63.00
" " No. 1.....71.00
Crown No. 2.....54.00
" No. 2½.....63.00
" No. 3.....69.00
Eureka, No. 1.....57.00
Novelty, No. 10, with Cog Wheels.....60.00
" No. 2, " 63.00
Excelsior, No. A, with Folding Bench.....84.00
" No. E, for Set Tubs.....66.00
Keystone No. 1, Wood Frame, no Gear.....54.00
" No. 2, Iron " " 54.00
" No. 10, Wood " Common Gear.....60.00
Peerless, No. 2.....63.00
" No. 2.....71.00
" No. 2½.....60.00

Stamped Tinware.
Common Stamped Ware, L. & G. List, April, 1878, dis 50&10 %
Stamped Deep and Retinned Ware, L. & G. List, April, 1878.....dis 50&10 %

METALS.

IRON.—DUTY: Bars, 1 to 1½c. ₩ ₤; Sheet, Band Hoop and Scroll, 1¼ to 1¾c. ₩ ₤; provided, that none of the above Iron shall pay a less rate of duty than 35 per cent. Pig, $7 ₩ ton; Polished Sheet, 3c. ₩ ₤; Wrought Scrap, $8 ₩ ton: Cast Scrap, $6 per ton. Railroad 70c. ₩ 100 ₤s. Boiler and Plate, 1½c. ₩ ₤.

Pig Iron—AMERICAN.

Foundry No. 1	₩ ton	$16.50 @ 18.00
" No. 2	₩ ton	15.50 @ 17.00
Gray Forge	₩ ton	14.50 @ 16.00

SCOTCH.

Glengarnock	₩ ton	24.25
Eglinton	₩ ton	23.50
Coltness	₩ ton	24.00

Rails.

Iron, at mill	₩ ton	$32.00 @ 36.00
Steel, "	₩ ton	43.00 @ 44.00
Old Rails	₩ ton	18.00

Scrap.
Wrought Scrap, from yard..₩ ton, nom. 21.00 @ 22.00

Bar Iron, from Store.
Common Iron :
¾ to 2 in. round and square.....
1 to 6 in. x ¾ to 1 in.....
} ₩ ₤ 1 75c
Refined Iron :
¾ to 2 in. round and square.....
1 to 6 in. x ¾ to 1 in.....
1 to 6 in. x ¾ and 5-16.....
} ₩ ₤ 2.00
Rods—⅜ and 11-16 round and square.....₩ ₤ 2.10
Bands—1 to 6x3-16 to No. 12.....₩ ₤ 2.40
Swedish Iron :
Ordinary sizes.....

Sheet Iron.

	Common American.	R. G. American.
Nos. 10 to 20	₩ ₤ 3 c	4
21 to 24	₩ ₤ 3¼c	4
25 to 26	₩ ₤ 3¼c	4¼
27	₩ ₤ 3¾c	4¼
28	₩ ₤ 4 c	4¾c
Galvanized, 14 to 20, B. B.	₩ ₤ 6¾c; 2d qual.	₩ ₤ 4½c
" 21 to 24, "	₩ ₤ 7¼c;	₩ ₤ 5 c
" 25 to 26, "	₩ ₤ 7¾c; "	₩ ₤ 5½c
" 27 "	₩ ₤ 8¼c; "	₩ ₤ 7 c
" 28 "	₩ ₤ 9 c; "	₩ ₤ 7½c
Patent Planished	₩ ₤ A, 10¼c; B,	9½c
Russia, Nos. 8 to 16	₩ ₤ 11 @ 11¾c	
American Cold Rolled	₩ ₤	4½c

COPPER.—DUTY: Pig, Bar and Ingot, 5c; Old Copper, 4c ₩ ₤; Manufactured (including all articles of which Copper is a component of chief value), 45 % ad valorem.
American Ingot.....₩ ₤ See Trade Report.

SHEATHING, BRAZIERS' COPPER, BOLTS, &c.

Braziers' Copper, ordinary sizes, over 16 oz., ₩ sq. ft.....₩ ₤ 28c
Braziers' Copper, ordinary sizes, 16 oz. and over 12 oz., ₩ sq. ft.....₩ ₤ 30c
Braziers Copper, 10 oz and 12 oz., ₩ sq. ft.....₩ ₤ 32c
" Lighter than 10 oz. ₩ sq. ft..₩ ₤ 34c
Circles less than 84 in. n diameter.....₩ ₤ 31c
Circles 84 in. diameter and over.....₩ ₤ 34c
Segment and Pattern Sheets.....₩ ₤ 31c
Locomotive Fire Box Sheets.....₩ ₤ 28c
Sheathing Copper, over 12 oz. ₩ sq. ft.....₩ ₤ 26c
Bolt Copper.....₩ ₤ 28c
Copper Bottoms.....₩ ₤ 30c
No Copper is Sheathing except 14x48 inches and not to exceed 34 oz. to the sq. ft.

TINNING.

14x48, by the case.....₩ sheet 6c
14x48, less than case.....₩ sheet 8c
For tinning both sides, double the above amount.

O'NEILL'S PATENT PLANISHED COPPER.

14x48.

14 and 16 oz. and heavier	By the case.	₩ ₤ 33c
12 oz. and lighter	" "	₩ ₤ 36c

Boiler Sizes.
7 in., 14x52. 8 in., 14x56. 9 in., 14x60.
14 and 16 oz. and heavier. ₩ ₤ 36c By the case. ₩ ₤ 39c
(And all sizes not over 20 in. wide.)
30x60.
14 and 16 oz. and heavier.....₩ ₤ 38c
12 oz.....₩ ₤ 41c

Brass.
Brown & Sharp's Gauge the Standard for Meta ; Old English Gauge the Standard for Wire.
BRASS MANUFACTURERS' PRICE LIST.
January 1, 1878.
Cash prices for Roll and Sheet Brass. For less quantity than 100 ₤s. add 3c ₩ ₤.

HIGH BRASS.

All Nos. not thinner than to No. 28, wider than 2 in., not wider than 14 in.....27c
All Nos. to No. 28, inclusive, and widths over 14 to 20 in., inclusive.....33c
All Nos. to No. 28, inclusive, and widths over 20 to 30 in., inclusive.....37c
½c. ₩ ₤ advance on each No. above Nos. 28 to 38, inclusive.
All Brass thinner than No. 38 is Platers' Brass, at...50c
Sheets 24x48, and all sheets cut to particular sizes and lengths under 30 in., in width wider than 2 in. 36c
Printers' Rules.....44c
Sheets wider than 30 in. and under 40 in.....45c
" " 40 in. and over.....47c
Circular Sheets, in diam. from 4 in. to 14, inclusive. 39c
" " over 14 " 20, " 44c
" " " 20 " 30, " 48c
" " " 30 " 40, " 51c
" " " 40 in.....54c

LOW BRASS.

4c ₩ ₤ more than High Brass.
Gilding Metal, 8c ₩ ₤ more than High Brass.
Platers' or Gold Metal { In Bars.....46c; Sawed.....49c; Planed or Polished.....52c

FOR SLITTING.

Metal in width 2 in. to ⅛ in. to No. 28, inclusive, 1c. ₩ ₤ advance.
Metal, in width 2 in to 1 in., thinner than No. 28, 2c. ₩ ₤ advance.
Metal, in width 1 in. to ⅛ thinner than No. 28, 3c ₩ ₤ advance.
Metal, in width ⅛ in. to ¼, inclusive, not thinner than No. 28, 2c. ₩ ₤ advance.
Metal, in width ⅛ in. to ¼ thinner than No. 28, 5c. ₩ ₤ advance,
Metal, ¼ in. in width and less, 10c. ₩ ₤ advance.
Any of the above widths cut to particular lengths, add 7c. ₩ ₤.

GERMAN SILVER MARKET METAL AND WIRE.

	Market Metal.	Wire.
4 per cent., 12 inch, to No. 26	$0.45	$0.75
6 " " "	.61	.83
10 " " "	.73	.99
15 " " "	.88	1.19
18 " " "	.97	1.31

German Silver Sheets over 12 in. wide and weighing more than 16 ₤s., $2.25 ₩ ₤.
Advance 2c. for each additional inch in width above 12 in., and 2c. ₩ ₤ on each No. thinner than Nos. 26 to 36, inclusive
All German Silver thinner than No. 36 is Platers, at 50c ₩ ₤ additional.
German Silver Scrap one-third less than net price of 12 in. Market Metal. German Silver Turnings, Filings and Chips, half the price of Scrap.

BRASS AND COPPER WIRE.

	High Brass.	Low Brass.	Gild'g and Copper.
No. 0 to 20	$0.30	$0.34	$0.40
No. 21	.33	.37	.43
No. 22	.34	.38	.44
No. 23	.35	.39	.45
No. 24	.37	.41	.47
No. 25	.40	.44	.50
No. 26	.42	.46	.52
No. 27	.45	.49	.55
No. 28	.49	.53	.60
No. 30	.52	.56	.64
No. 32	.55	.59	.69
No. 34	.59	.63	.75
No. 36	.63	.67	.81
No. 38	.67	.71	.90
No 24	.71	.75	1.00

Spring Wire 2c ₩ ₤ advance.
Flat, Square and Half Round Wire 5c ₩ ₤ advance on Round Wire.
Fancy Wire not less than 10c ₩ ₤ advance of Round Wire.
Brass Rods, No. 8 and smaller not less than 2 feet lengths, 40c.
Wire straightened and cut, smaller than No. 8, and not less than 2 feet lengths, 40c.
Wire and Rods less than 2 feet lengths, special rates.
Twelve cents per ₤ extra for spooling on 1 ₤ spools.

MISCELLANEOUS.

Common Plain Brass Pail Ears.....$0.40
Brass Door Rail.....40

SCRAP.

High Brass Scrap.....13c
Low " 15c
Gilding.....17c
Turnings, Filings and Chips half the price of Scrap.
Terms—Net cash. Interest to be added after thirty days.

TUBING.—dis 10 % ₩ ₤

Plain to No. 20 inclusive, above ¼ in. to 3 in.....$0.40
" above 3 in.....50
Nos. 21, 22, 23, two cents advance on List for each Number.
Nos. 24, 25, 26, four cents advance on List for each Number.
Above No. 26, special rates.
Plain, ¼ inch.....70
" 3-16 " 1.10
" ⅛ " 1.60
All Mandrel Drawn Tubes, 5 cents advance on List Prices.
Fancy Tubing to No. 20.....48c
English, Scotch and Extra Patterns Fancy Tubing to No. 20.....53
Tubing Sawed or Cut 2 to 4 feet long, 2 cents advance on List.
Add to 2 cents ⅛ cent for each additional cutting under 2 feet.
All Mandrel Drawn Tubes under ⅜ in., 25 cents per pound advance.

ZINC TUBING.—net.

Plain.....22
Fancy.....28
Scotch and Extra Patterns.....31

GERMAN SILVER TUBING.—dis 10 %

4 Per cent.....85
6 " 95
9 " 1.10
12 " 1.25
15 " 1.40
16 " 1.45
18 " 1.55
20 " 1.56

STEEL.—DUTY: Bars, Ingots, Sheets and Coils, valued at 7 cents ₩ ₤, or under, 2¼ cents; over, 7 cents, and not above 11, 3 cents ₩ ₤; over 11, 3½ cents ₩ ₤, and 10 % ad val. Railway Bars, 1¼ cents ₩ ₤. Railway Bars, in part Steel, 1 cent ₩ ₤. Provided, that Metal cemented, cast or made from Iron by the Bessemer or pneumatic process, of whatever form or description, shall be classed as

American Cast Steel.

Tool.....15c
Spring.....7c
Homogeneous.....12½c
Boiler Plate.....8c
Tire.....4½c
Machinery (round and square).....9c
File.....9c
Sheet.....11 @ 16c
Saw Plate, mill and mulay.....14 @ 16½c
" gang and X cut.....13 @ 14c
" circular as to size.....18 @ 30c

Chrome Steel.

Tool.....₩ ₤ 14 @ 15c
Tool, extra fine.....₩ ₤ 40 @ 75c
Spring.....₩ ₤ 8 @ 9c
Machinery.....₩ ₤ 8 @ 10c
Gun or Homogeneous.....₩ ₤ 12 @ 16c

English Steel,—Payable in gold, net.

Best Cast.....₩ ₤ 15½c
" Extra Cast.....₩ ₤ 16½c
" Round Machinery, Cast.....₩ ₤ 10c
" Swaged, Cast.....₩ ₤ 18c
" Best Double Shear.....₩ ₤ 15½c
" Blister, 1st quality.....₩ ₤ 13c
German Steel, Best.....₩ ₤ 11c
" 2d quality.....₩ ₤ 10c
" 3d quality.....₩ ₤ 9c
Sheet Cast Steel, 1st quality.....₩ ₤ 15½c
" " 2d quality.....₩ ₤ 14½c
" " 3d quality.....₩ ₤ 12½c

ANTIMONY.....13 to 13½c

LEAD.—DUTY: Pig $2 ₩ 100 ₤s; old Lead, 1½c ₩ ₤ Pipe and Sheet, 2¾c ₩ ₤.

American.....4@ 4¼ c
Bar.....4½c, dis 10 %
Pipe.....6c. dis 10 %
Tin Lined Pipe.....15c, dis 10 %
Sheet.....6½c, dis 10 %
Shot.....Drop 7½ Buck, 3½c, dis 10 %

BABBITT METAL.

N. P. U.....₩ ₤ 6 @ 7c
A 20c: B, 16c: C, 12c: D, 10c ₩ ₤.

TIN.—DUTY: Plates, Sheets, Tagger and Terne, 1.1c ₩ ₤; Elecro-galvanized Plates, 2c ₩ ₤; Manufactures of, not enumerated, 35 per cent. ad. val. Bars, Block and Pigs free. Banca, subject to duty of 10 per cent.
Banca.....₩ ₤ 19 currency
Straits.....₩ ₤ 16 @ 17 currency
English.....₩ ₤ 16 @ 17 currency

TIN PLATES, CURRENCY PRICES

I C 10x14, 12x12, 14x20	Prime Charcoal	$6.25 @ 6.37½
I X 10x14, 12x12, 14x20	Prime Charcoal	8.25 @ 8.50
D C 12½x17	"	5.75 @ 6.00
D X 12½x17	"	7.75 @ 8.00

For each additional X add.....

COKE TIN PLATE.

	Best.	2d quality.	Ordinary.
I C 10x14, I C 12x12, I C 14x20	$6.00	5.75	5.00 @ 5.50

TERNE PLATE.

	Prime Char.	2d qua.	Coke.
I C 14x20	$5.87 @	5.63½ @ 5.75	5.25 @ 5.50
I X 14x20	@ 8.00	....	....
I C 20x28	12.00 @ 12.25	11.50 @ 11.75	10.75 @ 11.00
I X 20x28	@ 10.00	....	....
I C 20x200	@ 19.00	....	....
I C 14x20 M. F. Brand			$7.25

SOLDER.....No. 1, 9 @ 10¼c; No. 2, 8¼ @ 9c
SPELTER—DUTY: In Pigs, Bars and Plates, $1 ₩ 100 ₤s.
American, cash.....5¼ @ 5¾c
Lehigh, on spot.....10c
ZINC.—DUTY: Pig or Block, $1.50 ₩ 100 ₤s. Sheet, 2¼c ₩ ₤.
Sheet, Cask.....6¼c
" Open.....5¾ @ 7c

Paper Stock, Old Metals, &c

(Dealer's Selling Price.)

Canvas linen.....4 @ 4¼
" cotton, No. 1.....4½ @
" " No. 2.....3½ @
White linen rags, No. 1.....5¼ @ 5
" " No. 2.....3¼ @
Seconds.....2¼ @
Mixed woolens.....2½ @ 3¼
Soft woolens.....7 @ 7½
Gunny bagging.....3¾ @
Jute Butts.....3 @ 3½
Kentucky bagging.....5 @
Waste paper and scraps.....1 @ 1¾
Rope cuttings.....1¾ @ 3
Kentucky bale rope.....4 @ 4½
Oakum junk, No. 1.....5¾ @ 5¾
" No. 2.....@ 4
Grass rope.....3 @
Tarred shaking.....2 @
White collar cuttings, all paper.....7 @
" " muslin lined.....5 @
" " Envelope.....7 @
Hard White Shavings, No. 1.....5¾ @
Soft " " No. 1.....4½ @ 4¾
White Shavings, No. 2.....4½ @ 4¾
Mixed Shavings, part white.....3½ @ 4
Imperfections, No. 2, best folded sheets.....4½ @
" No. 1, Heavy Stock.....4¼ @
Book Stock.....@ 3¼
" Heavy.....3 @
" " Light.....1½ @
Newspaper Stock.....1¾ @ 2
Prints.....1½ @ 2
Pure Manilas.....2¾ @ 2¾
Bogus Manilas and Hardwares.....1 @
Commons.....½ @
Binders' Board Cuttings.....1 @ 1¼
Straw Board Cuttings.....¾ @
Woolen Tailor Clips.....1¾ @ 14
Satinet " .....2 @ 2½

Old Metal.

Copper, heavy.....14½ @
Copper Bottoms.....12½
Yellow Metal.....13 @
Brass, light.....8½ @
" heavy.....10½ @
Heavy Composition.....13 @
Old Lead, solid.....@ 3¼
Tea Lead.....@ 3¾
Zinc.....@ 3½
Pewter, No 1.....10 @
" No. 2.....8 @
Wrought Iron.....per ton $17.00
Machinery Iron.....per ton 11.00
Light Iron.....per ton 10 00
Stove Plate.....per ton 10.00
Grate Bars.....per ton 4.00

Paints, Oils, &c.

Paints.

Black Lamp, Coach Painters.....₩ ₤ 20c
" " Ordinary.....6c
" Ivory Drop, fair.....12 @ 15c
" " best.....20c
Black Paint, in oil.....kegs, 40 asst'd cans, 11c
Blue, Prussian, fair to best.....40 @ 55c
" " " in oil.....35 @ 45c
Blue Chinese dry.....8½c
" Ultramarine.....18 @ 30c
Brown, Spanish.....1¾c
" Van Dyke.....10@12c
Carmine, 4c.....combination price
Green, Chrome.....15 @ 23c
" " in oil.....14 @ 18 @ 25c
" Paris.....good 25c; best, 30c
" " in oil.....30c; " 45c
Iron Paint, Bright Red.....₩ ₤ 2½c
" Red.....₩ ₤ 2c
" Brown.....₩ ₤ 1½c
" Purple.....₩ ₤ 3c
" Ground in Oil, Bright Red.....₩ ₤ 3½c
" " Red.....₩ ₤ 2c
" " Brown.....₩ ₤ 1½c
" " Purple.....₩ ₤ 6c
Mineral Paints.....1¼ @ 4c
Orange Mineral.....12c
Red Lead, American.....7½c
" English.....9½c gold
" Venetian (N. C.) dry.....$1.70 @ $1.75
" " in oil.....asst'd cans, 11c; kegs, 8c
" Indian dry.....@ 12c
Rose Pink.....10 @ 13c
Sienna, American, Raw.....4c
" Burnt.....4½c
" " in oil.....10 @ 16 @ 20c
" Raw.....11 @ 15 @ 25c
Umber, Burnt.....4 @ 8c
" " in oil.....9 @ 12 @ 16c
" Raw.....3½ @ 7½c
" " in oil.....10 @ 16 @ 18c
Vermillion, Chinese.....90c, gold
" English.....60c, gold
" Trieste.....1.10, gold
" American, Common.....18c
White Lead, American, pure dry.....8c
" " in oil.....8½c
White, Paris, English, prime.....in bbls. 2 @ 2½c
Yellow Ochre, French.....$1.75
" " in oil.....asst'd cans, 11c; kegs, 8c
" " Vermont.....in casks 1½c
Yellow Chrome.....17 @ 27c
" " in oil.....14 @ 18 @ 25c
Zinc White, American No. 1, dry.....8½c
" " No. 1, in oil.....11c
" French (Paris).....11c
" " in oil.....10½ @ 11½c

Oils.

Linseed, Raw, in casks and bbls.....₩ gal. 58c @ 60c
" Boiled. " " ....." 63c @ 65c
Whale, Crude.....bbl. 53c @ 55c
" Bleached Winter.....bbl. 65c @ 70c
" Unbleached.....bbl. 62c @ 63c
Cotton Seed, Crude.....bbl. 60c
" Southern Yellow.....bbl. 55c
" White.....bbl. 65c
Neatsfoot, Winter.....70c @ $1.10
Natural Lubricating.....36c @ 38c

Sundries.

Asphantum.....9c
Benzine.....₩ gal. 16c
Chalk.....3½c
" Block.....3½
Dryer, Patent, Am'n.....ass't cans, 10½c; kegs, 9c
Frostings.....9c
Glue, White.....33 @ 44c
" Sheet.....20c
Glaziers' Points, Zinc.....50
Gum, Copal.....16c
" Damar.....25c
" Shellac, English.....90c
" " dark.....25c
Litharge, Englisgh.....9c gold
Pumic Stone, selected Lumps.....4 @ 6c
" powdered.....2½c
Putty, in bladders.....2½c
" in bulk.....2c
Rotten Stone, soft, English.....8c
Spirits Turpentine.....33c
Whiting Spanish.....½c

Glass.

FRENCH WINDOW GLASS.
Prices current per box of 50 feet.

Single Thick.—discount 60 %

SIZES.	1st.	2d.	3d.	4th
6 x 8 to 10 x 15	$ 7.50	$ 6.75	$ 6.25	$ 5.75
11 x 14 to 16 x 24	8.50	7.75	7.25	6.25
13 x 22 to 20 x 30	10.75	9.75	8.75	7.75
15 x 36 to 24 x 30	12.25	10.75	9.00	
26 x 28 to 24 x 36	13.00	11.50	9.75	
26 x 37 to 26 x 44	14.50	13.25	10.75	
26 x 46 to 30 x 50	15.00	14.00	11.25	
30 x 52 to 30 x 54	16.00	14.50	12.00	
30 x 56 to 34 x 56	17.25	15.50	13.50	
34 x 58 to 34 x 60	18.25	17.25	15.00	
36 x 60 to 40 x 60	20.75	18.75	17.25	

Double Thick.—Discount 60&10 %

SIZES.	1st.	2d.	3d.	4th.
6 x 8 to 10 x 15	$12.00	$11.00	$10.00	$ 9.2
11 x 14 to 16 x 24	13.75	12.50	11.75	10.5
18 x 22 to 20 x 30	17.25	15.75	14.00	
15 x 36 to 20 x 30	19.75	17.25	14.50	
26 x 28 to 24 x 36	21.00	18.50	15.75	
26 x 36 to 26 x 44	23.25	21.25	17.25	
26 x 46 to 30 x 50	24.00	22.50	18.00	
30 x 52 to 30 x 54	25.75	23.25	19.25	
30 x 56 to 34 x 56	27.75	25.00	21.75	
34 x 58 to 34 x 60	29.25	27.75	24.00	
36 x 60 to 40 x 60	33.25	30.00	27.75	

Sizes above 40 x 60—$10.00 per box extra for every five inches.
An additional 10 per cent. will be charged for all Glass more than 40 inches wide. All sizes above 52 inches in length, and not making more than 81 united inches

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CAST STEEL WIRE for all purposes.

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☞ Every machine warranted to work as represented.

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Width of Cutter.	Description.	Price.
12 inch.	8 in. driving wheel, wt. 33½ lbs. Can be used by a lad..	each, $18.00
14 "	8 in driving wheel, wt. 34¾ lbs. Can be used by a lady..	" 20.00
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LOOK WELL TO YOUR HORSE'S FEET.

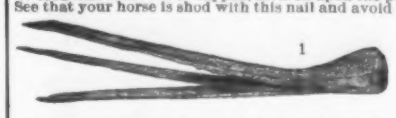
This drawing shows how many horses are made lame and permanently injured by the use of the *cold-cut* and *sheared pointed* nails. This process of manufacture produces lamination, causing the iron to form in layers, and when driven into the foot the horny fibres of which the hoof is composed cause the nail to separate at the point and one portion passes *into* the foot.

No. 4 represents one of these nails which was driven into the hoof, and *slivered* in driving, one *thin* blade passing into the quick or sensitive sole. No. 5 the *thick* blade of the nail passed out of the wall of the hoof for clinching. After a few days the horse was returned lame, and upon the removal of the shoe, a nail similar to the above was broken off, leaving the sliver in the foot; *lockjaw* ensued, from which the horse died. Upon dissecting the foot a portion of the nail was found to have penetrated through the Coffin bone, as seen in Fig. 2, letter A thus sacrificing the life of a valuable animal.

It requires but little observation and reflection, one would think, to arrive at the conclusion as to the kind of nails to be used in the horse's foot; whether a mangled piece of iron, rendered DANGEROUS by the *Cold-Rolling and Shearing* process, or one made from the rod at a welding heat, where all the fibres remain intact, and a perfect *oneness* maintained, and which being pointed by the hammer, *every* nail is inspected, rendering such an accident as slivering utterly impossible.

The foot is the *most important* member of the animal's body, to which the greatest care and attention should be directed; for when it becomes injured or deceased, no matter how perfect or sound the other parts may be, the horse's services are diminished or altogether lost. Hence the value of a horse depends upon the condition of his feet. "NO FOOT NO HORSE"

As the remedy lies with the owner of the horse, it is for him to prohibit any cold-rolled or sheared nails being used in his horse's feet. **The only Hot-Drawn and Hammer-Pointed Horse Shoe Nail in the World that is *not cut or clipped, sheared* upon the point, and will not split in driving, is the PUTNAM NAIL.** See that your horse is shod with this nail and avoid all risks. For sale by all dealers in Horse nails.



The above drawing was made from a nail, showing the lamination of iron in the *Cold-Rolled and Shearing* process.

This drawing was made from the nail taken from the hoof and coffin bone, as shown in Figs. 1 and 2.

We have known several cases in which valuable horses have been badly lamed by the use of *Cold-Rolled and Sheared* horse shoe nails. We have used the same nails and been compelled to banish them from our shop. The Hot Forging process is the only sure manner of making a true driving and safe nail.

REV. W. H. H. MURRAY, *Golden Rule*, October 31, 1877.

OFFICE OF THE LEDGER, NEW YORK, November 22, 1877.

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ROBERT BONNER.

SAN FRANCISCO, January 4, 1878.

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These Nails ARE **Guaranteed to be Equal** to the best in the market, and are sold at greatly reduced rates.

5d	6d	7d	8d	9d	10d
26c.	23c.	21c.	20c.	19c.	18c.

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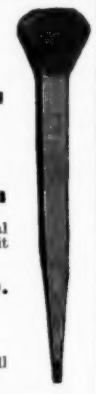

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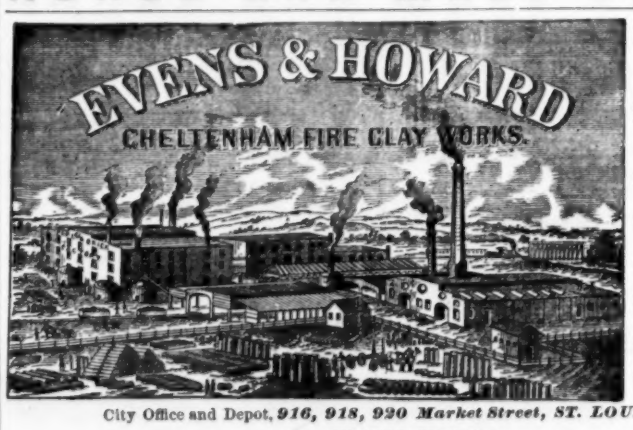

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GRINDSTONES,

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Composite Grindstones,

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All grades for **fine** and **coarse** work. **Superior** to any foreign or domestic Stone and **cheaper.** Send for Price List and testimonials.

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Buff and Light Drab Colors. Independence and Amherst Grindstones, for every variety of grinding. Ohio Fire-proof and Mineral Paints. Fire-proof Stove Putty. Orders promptly filled. **CLEVELAND, O.**

Steam Oil Stone Works.

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STONES,

☞ Of various sizes and patterns, suited to every variety of Mechanical use. **New Albany, Ind.**

Send for price list.

BOYD & CHASE

The largest manufacturers in the world of

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STONE

Of all description.

107th Street and Harlem River,

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"Bridgewater Iron Co.'s Horse Nails."

LIST PRICE, Pointed and Polished.

No.	*5*	*6*	*7*	*8*	*9*	*10*
	26c.	*23c.*	*21c.*	*20c.*	*19c.*	*18c. per lb.*

Full Assortment of above always on hand

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N. STETSON JR., Agent,

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Coal.

A. PARDEE, Hazelton, Pa. J. G. FELL, Phila

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Calvin Pardee & Co. HOLLYWOOD.

Pardee, Sons & Co. Mt. PLEASANT.

THE HOBOKEN COAL CO.,

Dealers in

SCRANTON, LEHIGH and other COALS.

Retail Yard on D. L. & W. Railroad, cor. Grove and 19th Sts., Jersey City. Coal delivered direct from Shutes to Carts and Wagons. Families and manufactories supplied with the best qualities of Coal at the lowest rates

OFFICES At Yard cor. Grove and 19th Sts.; e. r. Bay St. and Newark Ave., Jersey City; Room 35, 111 Broadway, N. Y. General Office, Bank Building, cor Newark and Hudson Sts., Hoboken. P. O. Box 241, Hoboken.

WHEELING HINGE CO.,

Wheeling, West Va.,

Manufacturers of

Wrought Butts, Strap & T Hinges, Wrought Hooks, Hasps & Staples, Wrought Repair Links & Washers,

GRAHAM & HAINES, Sole Agents, 113 Chambers & 95 Reade Sts., N. Y.

CLARK & CO.,

MANUFACTURERS OF

BUILDERS' HARDWARE.

426 and 428 Niagara Street, BUFFALO, N. Y.

TENNIS & WILSON, Agents, - - 81 Beekman Street, New York.

Send for Catalogue and Price List.

The American Machine Co.,

MANUFACTURERS OF

And Other

HARDWARE SPECIALTIES.

Office and Factory,

1916 to 1924 North Fourth Street, - - - PHILADELPHIA, PA.

"FELTER'S PATENT LOCKS,"

MANUFACTURED BY

The American Lock Mfg. Co.,

Are the most SECURE and DURABLE ever made.

SECURE

Because they have 40 Brass Tumblers, independent in their action, either one of which will prevent the cock from being opened unless brought to proper position by the Key.

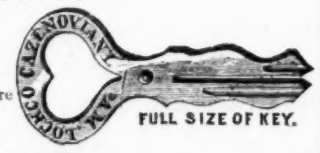
DURABLE

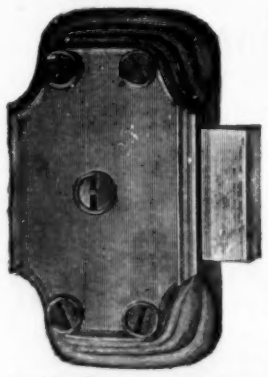
Because we use no Springs to break or get out of place.

THEY HAVE

STERLING METAL KEYS

That will not corrode or wear, and are stronger than steel.





Upright Rim Dead Locks,

Horizontal Rim Night Latches,

Horizontal Rim Tubular Night Latches,

Mortise Night Latches, Plain Fronts,

Mortise Night Latches, Ornamental Bronze Fronts and Knobs,

Brass Chest, Box, Cupboard and Drawer Locks,

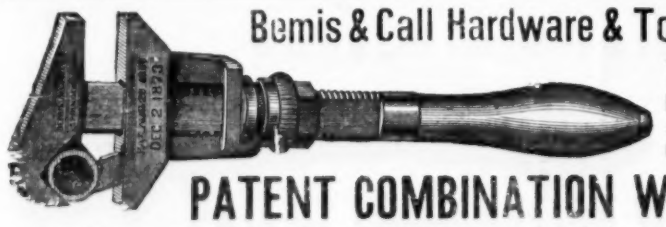
Solid Bronze Padlocks.

Illustrated Catalogue and Price List sent on application.

All orders should be addressed to

UNION NUT CO., General Agents, 99 Chambers St., N. Y

Bemis & Call Hardware & Tool Co.



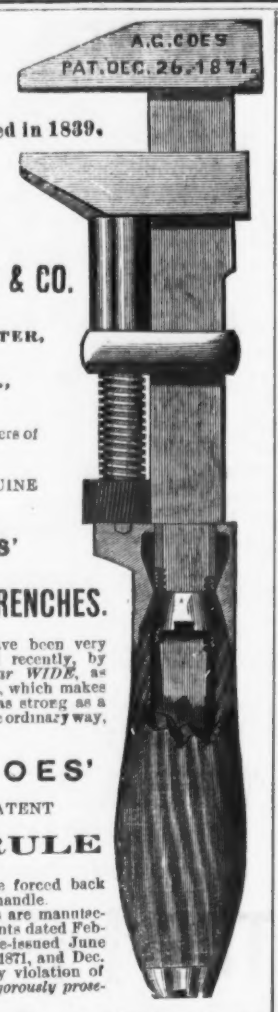
This Wrench can be furnished with Briggs' Pat. Nut or Sleeve.

PATENT COMBINATION WRENCH.

These Wrenches are made from the best of Wrought Iron, with Steel Head and Jaw, Case-Hardened throughout, and not only combine all of the superior qualities of our cylinder or Gas Pipe Wrenches, but also all requisite Combinations of a regular Nut Wrench, thus making a Combination which has no equal.

For Circulars and Price List, address,

BEMIS & CALL HARDWARE & TOOL CO., Springfield, Mass.



Established in 1839.

A. G. COES & CO.

WORCESTER, Mass.,

Manufacturers of

THE GENUINE

COES'

SCREW WRENCHES.

Our goods have been very much improved recently, by making the *Bar WIDE*, as shown in the cut, which makes a 12 in. Wrench as strong as a 15 in. made in the ordinary way, and by using

A. G. COES'

NEW PATENT

FERRULE

Which cannot be forced back into the handle.

☞ Our goods are manufactured under Patents dated February 7, 1860, (re-issued June 29, 1871), May 2, 1871, and Dec. 26, 1871, and any violation of either will be *vigorously prosecuted*.

We call particular attention to our new Patent Ferrule, with its supporting Nut (shown in section in the above cut), which makes the strongest Ferrule fastening known.

A. G. COES & CO.

Our Agents, GRAHAM & HAINES, 113 Chambers St. New York, carry a full line of our goods, and will be pleased to serve you at factory prices.

N. Y. MALLET and HANDLE WORKS

Manufacturers of

Calkers', Carpenters', Stone Cutters' Tin, Copper and Boiler Makers'

MALLETS,

Hawsing Beetles, Hawsing and Calking Irons also all kinds of Handles, Sledge, Chisel and Hammer Handles. Also

COTTON AND BALE HOOKS,

Patented Feb. 13, 1877; a new combination of Hooks.

456 E. Houston St., New York City.

W. & J. TIEBOUT,

MANUFACTURERS OF

Brass, Galvanized and Ship Chandlery

HARDWARE.

290 Pearl Street, NEW YORK.

Wilson Bohannan,

Manufacturer of Patent

BRASS

Pad Locks,

FOR

Railroad Switches, Freight Cars, and the Hardware Trade.

All sizes, with Brass and Steel Keys, with & without chains.

Passenger Car Locks,

Bronzed, Nickel-Plated and Japanned.

Patent Tubular Night Latches.

Will answer for Doors from 1¼ to 2 inches.

BROOKLYN, N. Y.

☞ Catalogues and Samples sent upon application.

ROMER & CO.,

Established 1837. Manufacturers of Patent Scandinavian or Jail Locks. Brass Pad Locks for Railroads and Switches. Also, Patent Stationary R. R. Car Door Locks. Patent Piano and Sewing Machine Locks.

141 to 145 Railroad Avenue, NEWARK, N. J.

Illustrated Catalogue sent on application.

COBB & DREW,

Plymouth, Mass.

Manufacturers of Copper, Brass, and Iron Rivets: Common and Swedes Iron, Leathered, Carpet, Lace and Glass Tacks; Finishing, Hungarian, Trunk Clout and Cigar Box Nails, &c. Rivets made to Order.

NEW YORK AGENCY

George C. Grundy,

HARDWARE.

165 Greenwich Street.

Agent for the Philadelphia Star Carriage and Tire Bolts.

SAM'L G. B. COOK & CO.,

American and Foreign

Hardware and Cutlery Manufacturers' Agents,

Nos. 5 & 7 German St., - - BALTIMORE.

Represent and carry in stock a full line of the following manufacturers' goods, which we offer the Trade at manufacturers' prices and terms:

American Screw Co., Screws.
American Tea Tray Co.
American Machine Co., Crown Fluters, Wringers, etc.
Branford Lock Works.
Beardsley Scythe Co.
Bailey Tool Co., Defiance Iron Planes.
T. H. Bullock, Bellows.
Carr, Crawley & Devlin, Building, Cabinet and Saddlery Hardware.
Clark & Co., Patent Blind and Gate Hinges.
Cowles Hardware Co., House Furnishing and other Hardware.
Clark Bros. & Co., Carriage, Tire and other Bolts.
Connecticut Cutlery Co., Pocket Cutlery and Trimmers.
H. Chapin's Son, Rules, Levels, etc.
John Chatillon & Sons, Balances.
L. Coes & Co., Patent Screw Wrenches.
A. Field & Sons, Tacks, Nails, etc.
Forsythe Scale Works, Scales and Wrought Goods.
Hubbard, Bakewell & Co., Lippencott Axes and Shovels.
Iowa Farming Tool Co., Handled Hoes and Rakes, Snaths, etc.
Kimball Shovel Co., Solid Cast Steel Shovels and Spades.
Klein, Logan & Co., Picks, Mattocks, Grub Hoes, Fire Shovels, etc.
Henry W. Kip, C. S. Hammers.
Lancaster Bolt Co., Eagle Carriage and Tire Bolts.
Lamson & Goodnow Mfg. Co., Table Cutlery, Butcher Knives, etc.
Meriden Britannia Co., Plated Ware and Britannia Spoons.
W. T. & J. Mersereau, Stair Rods, etc.
Wm. McNeice, Saws.
Nicholson File Co.,
Saranac and International Horse Nails.
Northwestern Horse Nail Co.
Peck Bros. & Co., Brass Cocks.
A. G. Patton, Enameled and Tinned Hollow Ware.
Rogers Bros., "A1 1847" Plated Spoons, Forks, etc.
Roy & Co., Strap and T and Hook and Eye Hinges, Wrought Butts, Nuts, Washers, etc.
James R. Torrey's Razors and Straps.
U. S. Lock Co., Shepherdston's Patent Locks.
O. B. Wilson, Cow Bells.

And other manufacturers, making our assortment of

Builders', Cabinet, Agricultural and House Furnishing Hardware & Cutlery.

As complete as can be found in any house. Also full stock of

Wostenholm's, Rodgers', Field & Co., Continental and German Cutlery, W. & S. Butcher's Razors, Edge Tools and Files.

Full line of

REVOLVERS AND CARTRIDGES.

And a general assortment of

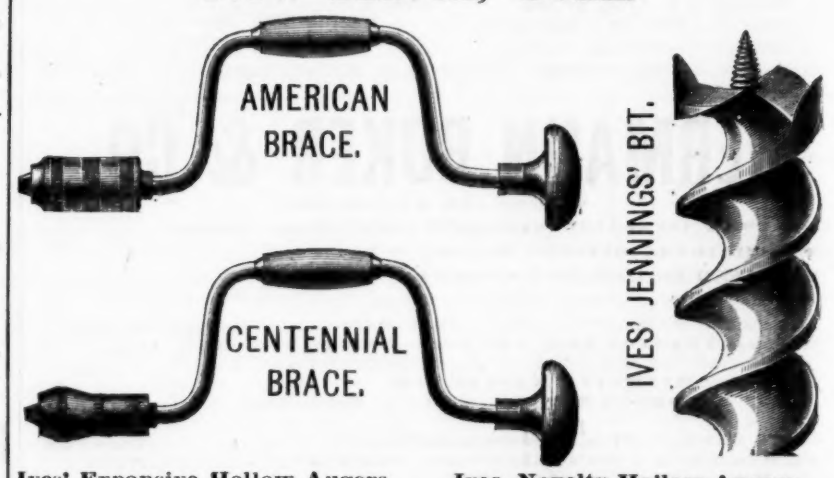
SHELF AND HEAVY HARDWARE.

Orders filled promptly from stock.

☞ Consignments of desirable goods solicited.

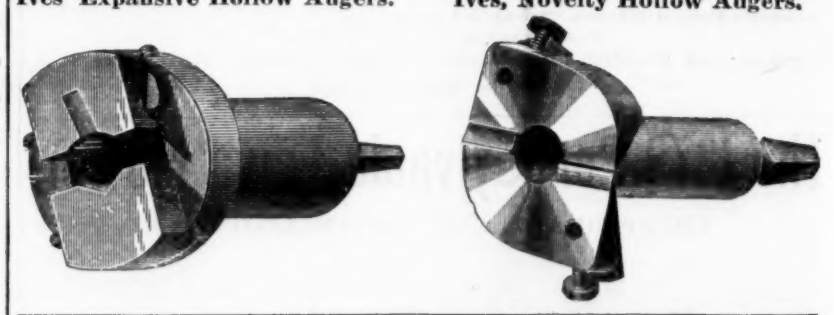
WILLIAM A. IVES & CO.,

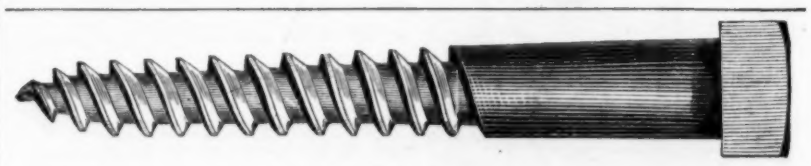
New Haven, Conn.



Ives' Expansive Hollow Augers.

Ives, Novelty Hollow Augers.





WM. H. HASKELL & CO.

Pawtucket, R. I.,

MANUFACTURERS OF

COACH SCREWS

(With Gimlet Points),

ALL KINDS OF

Machine and Plow Bolts,

FORCED SET SCREWS,

AND

TAP BOLTS.

PHILADELPHIA.

(Corrected weekly by Lloyd, Supplee & Walton).

Terms, 30 days. For 60 or 90 days, interest added at 10 per cent. per annum.

Anvils.
Peter Wright's, ₩ ℔, gold.....10½c
over 250 lbs.....11c. gold, net
Wilkinson's, ₩ ℔, gold.....11c. net
Eagle (American).....9 cents per lb—dis 20%

Apple Parers.—
Reading No. 72.....per doz $ 5 50 net
" " 75..... " 6 25 net
" " 76..... " 7 00 net
" " 77..... " 7 50 net
Peach Parers..... " 10 00 net
Little Favorite, corer and slicer..... " 7 50 net
Lots of 10 to 25 dozen special price.

Axes.—
Mann's Red Warrior .....Per doz. $8 50 @ 9 00 net
Red Indian..... " 8 50 @ 9 00 net
Red Chieftain, bevelled..... " 9 00 @ 10 00 net
Crown Prince ..... " 9 50 @ 10 50 net

Augers and Auger Bits.—
Bates' Nut Augers. ..... dis 40&10 @ 50 %
Cook's Augers..... dis 50 @ 5?&5 %
Watrous' Ship Augers..... dis 15 %
Benjamin Pierce Auger Bitts..... dis 40 %
Griswold Auger Bits..... dis 40&10 @ 50 %
Cook's " " ..... dis 50 @ 50&5 %
Jennings' " " ..... dis 10&10 %
Bonney's Pat. Hol. Augers, list $48 ₩ doz...dis 25&10 %
Stearns' Pat. Hol. Augers " $48 " ...dis 25&10 %

Balances.—
Light and "Common".....dis 25&10 %
All other Spring Balances..... dis 25 %

Bells.—
Bevin Bros. Mfg Co. Light Hand Bells.....dis 70 @ 75 %
Swiss Pattern Hand Bells.....dis 50 @ 50&10 %
Connell's Door Bells..... dis 50 @ 50&10 %
Gt. Western & Kentucky Cow, new list. .....dis 50 %

Borlog Machines.—
Upright, with Augers.....List $9 00 dis 40&10 %
" without Augers ..... " 6 50 dis 40&10 %
Angular, with Augers..... " 11 00 dis 40&10 %
" without Augers..... " 7 00 dis 40&10 %

Bolts.—Eastern Carriage Bolts .....dis 75&3? %—cash
Philadelphia " " .....dis 60&10 @ 60&20 %
Stanley, Wrought Shutter.....dis 50 %

Braces.—Barber's.....dis 40&5 %
Backus.....dis 50 @ 50&10 %
Snodgrass.....dis 50 %
American Ball.....dis 25&10 %

Butts.—Cast Fast Joint, Narrow.....dis 60&10 %
" " Broad.....dis 65&10 %
Cast Loose Joint, Narrow.....dis 70&10 %
" " Broad.....70&10 %
" Acorn, Loose Pin.....dis 65&10 %
" Acorn " Jap'd.....dis 67½&10 %
Mayer's Loose Joint.....dis 70&10 %
Wrought Loose Pin.....dis 40&10 %
" Table Hinges and Back Flaps.....dis 65&10 %
" Narrow, Fast.....dis 40&10 %
" Loose Joint.....dis 40&10 %

Blind Butts.
Parker.....dis 60 @ 60&10 %
Clark.....dis 60 %
Shepard.....dis 60 %
Lull & Porter.....dis 66⅔&10 %
Huffer's.....dis 33⅓ @ 33⅓&10 %

Chains.—German Halter and Coil..... dis 30&5 % gold
Galvanized Pump.....₩ ℔ 10½c net
Best Proof Coil Chain—(English).

₩ ℔.....11½	8½	7¾	7⅛	8½	8¼	7c gold
5-16	¼	5-16	⅜	7-16	½	⅝ in.

Chisels.—Socket Framing.....dis 65, 5&10 %
Socket Firmer.....dis 65, 5&10 %
Butcher's.....$5 00 to £ gold

Cisterns.—Bed .....dis 50&10 %
Plate.....dis 50&10 %

Coffee Mills.—Box and Side.....dis 25 %
Enterprise.....dis 20 %

Cutlery.—Walden Pocket.....dis 30 @ 35 %
Landers, Frary & Clark, J. Russell & Co., Lamson & Goodnow Mfg. Co. and Meriden Cutlery Co., Manufacturers' prices net

Drawing Knives.—
Hart Mfg Co.'s.....dis 65, 5&10 %
Adjustable Handle.....dis 20 %

Fry Pans.
Tinned.....dis 50&10 @ 60 %

₩ doz.	$3 50	4 00	4 50	5 00	5 50	6 50	7 50	9 00 10 00
No....	0	1	2	3	4	5	6	7 8

Burnished.....dis 50&10 @ 60 %

₩ doz.	$3 00	3 75	4 25	4 75	5 25	6 00	7 00	8 00 9 00
No....	0	1	2	3	4	5	6	7 8

Files.
Nicholson.....dis 35 %
Disston.....dis 35 %
Butcher.....$1 50 £ gold
Spencer.....$1 50 @ 4 75 £ gold

Fluting Machines.
Imperial—1¼ in. roll..... each $2 50 net
" —6 in. roll..... " 3 00 net
Eagle—3¼ in. roll.....per doz, $30 00
" —5¼ in. roll..... " 40 00
Crown—1¾ in. roll.....Each 4 00 } dis 45 %
" —6 in. roll..... " 4 75
" —8 in. roll..... " 7 25
Geneva Fluter.....per doz. 15 00 net
Favorite com. Fluter & Sad-iron..₩ doz $20 dis 25&10 %

Hammers.
Yerkes & Plumb's.....dis 25 @ 30 %
Hammond & Son's.....dis 25 @ 30 %

Hatchets.
Yerkes & Plumb.....dis 25 @ 30 %
Hammond.....dis 25 @ 30 %
Hunt.....dis 25 %

Hinges.
Strap and T.....dis 60 @ 60&5 %

Horse Nails.

Nos.	5	6	7	8	9	10
Ausable	30	27	25	24	23	22
" Polished & Pt'd and Blued and Pointed	31	28	26	25	24	23
Globe.....Net list	26	23	21	20	19	18
Clinton	22	20	19	18	17	
" Polished and Pointed	23	21	20	19	18	

Southern, all sizes.....₩ ℔ 14c. net
Discount on Ausable and Clinton, 20 %; Globe, net.

Locks and Knobs.
Branford.....new list, dis 60&10&2 % cash
Gaylord Cabinet.....dis 25&2 % cash
United States Lock Co.....dis 35 %
American Padlocks.....dis 33⅓, 5&2 % cash
Scandinavian Pad Locks.

₩ doz...	$5 00	5 50	6 50	7 50	8 50	10 00	12 50 } dis 50 %
No.....	57	58	59	60	61	62	63 }
₩ doz.....	$15 00		26 00		33 00		} dis 50 %
No.....	64		65		66		}

Lanterns.—
Square Candle and Oil.....₩ doz. $2 75 @ 3 00
Tubular.....No. 0, $10 50; No. 1, 12 50 ₩ doz. net
Guards, 50 cents extra per doz. net.

Mattocks.
Long and Short Cutter.....₩ doz. $9 00 @ 9 50 net
Pennsylvania Pattern..... " 9 50 @ 10 00 net

Molasses Gates.
Enterprise Mfg. Co.'s Measuring Faucets.....dis 20 %
Stebbins' Gates..... dis 62½&10 %
Lincoln's " .....dis 62½&10 %
Landers, Frary & Clark's Petroleum.....dis 20&10 %
Brass Liquor Cocks ..... dis 5 %
Cork Lined " .....dis 65 @ 65&10 %

Meat Cutters.—Dixon's.....dis 25 @ 30 %
Woodruff.....dis 25 @ 30 %
Stowe.....dis 25 @ 30 %
Hale's..... new list, dis 50&2 %
American.....dis 25 %
Stuffers.....dis 25 @ 30 %
Enterprise Stuffers.....dis 20 %

Planes.—Sandusky.....dis 35 %
Ogontz.....dis 50&10 %
Bailey.....dis 25&10 %

Plane Irons.—Sandusky.....dis 10&10 %
Butcher's.....gold £, $5 59

Plumbs and Levels.
Stanley's Adjustable.....dis 60&10 %
" Non-Adjustable.....dis 60&10 %

Picks.—Philadelphia .....dis 20 %
Hunt's .....dis 25 %

Rules—Stanley Boxwood.....dis 60&10 %
Stanley Ivory.....dis 50&10 %

Steelyards.—Hart's Pattern.....dis 60&10 %

₩ doz.....	$14 50	17 75	21 00	26 50	31 00	35 50
Lbs	50	100	150	200	250	300

American Pattern.....dis 25 @ 25&10 %

₩ doz.....	$5 50	7 00	9 00	10 00	11 00	12 00
Lbs.....	50	100	150	200	25?	300

English Pattern.....dis 25 @ 25 %

₩ doz.....	$7 00	8 67	10 67	12 67	14 67	16 67
Lbs.....	50	100	150	200	250	300

Squares.—
Steel and Iron.....dis 50 %; full case, dis 50&10 %
Try Squares, Stanley.....dis 45&10 %
Disston's Try Squares.....dis 45 %

Scythes.—Golden Clipper, Damascus Blade, Boxed and Sharpened.....₩ doz. $9 00 net
Clipper No. 10, Bronze Blade Boxed and Sharpened..... " doz. $8 50 net
Clipper No. 5, Painted Red, Boxed and Sharpened.....₩ doz $8 25 net

Saws—Disston's Hand, Panel and Rip.....dis 20 %
Disston's Circular.....dis 30 %
" Cross-Cut No. 2, Plain Tooth..₩ ft., 45c. net
" " Patent Tooth.....₩ ft., 43c. net
" " Champion Tooth....₩ ft., 38c. net

Shovels and Spades.
Rowland.....dis 50&5 %
Oliver Ames & Sons, new list.....dis 30 %

Sad Irons.—4 to 10 lbs.....₩ ℔., 2½ @ 2¾c
Mrs. Potts' Patent.....dis 30 @ 40 %

Stone.—Arkansas Oil Stone.....₩ ℔ $2 00 net
Washita Extra..... " 35c net
" No. 1..... " 30c net
" " 2..... " 25c net
" Slips..... " 6½c net
" Axe..... " 25c net
Turkey Oil Stone No. 1..... " 16½c net
" " " 2..... " 18c net
" Axe Stone..... " 25c net
Hindostan Oil Stone No 1.....₩ ℔ 4 @ 4½c net
" Axe Stone..... " 5 @ 5½c net

Screws.
United States and others in Combination.....dis 60 %

Spoons.—
Plated.....dis 40 @ 40&5 %
German Silver.....dis 30&5 %
Britannia, Boardmans.....dis 50&10 %
" Parkers.....dis 50&10 %
Tinned.....dis 15 @ 20 %
" by case.....dis 20 %

Springs.—Torrey.....₩ doz $2 00 @ 2 10 net
Philadelphia .....8 in., $5 00; 8 in., $7 00 ₩ doz. dis 25 %
Chatfield.....No. 1, $3 50; 2, $4 00; 3, $6 00 ₩ doz. net
Gem Coil No. 1, Large Jap'd..... ₩ doz $3 50)
" " No. 2, Medium Jap'd..... " 2 50) dis
" " No. 3, Small " " 2 00)

Stocks and Dies......dis 10&5 %

Stove Polish.—Gem..... ₩ gross, $4 50, dis 5 %
Dixon..... " $6 00, dis 5 %
Onyx..... " $4 00 @ 4 25 net

Tacks, Brads, &c.
Tacks, Half Weight American..... dis 75 %
" Full " " .....dis 50 %
" Half " Swedes..... dis 65 %
" Full " " .....dis 50 % } Extra
" Carpet, Am. and Swedes.....dis 20 % } 20@40 %
" Leather Head.....net
" Copper.....₩ ℔ 58c., net
Brads, Half Weight.....dis 50 %
Shoe Nails—
4-8 and larger, 9c; 3½-8, 9½c ₩ ℔. dis 20&10 %

Trunk, Clout and Finishing Nails—

⅝	⅝	½	½	1	1¼ and over
25.	20.	17.	15.	13.	11c ₩ ℔, dis 20&10%

Double Pointed Tacks .....dis 40&5 %

Traps.
Genuine Oneida—Newhouse.....dis 30 %
Im. Oneida—Newhouse list (1st qual.).....dis 60 %

Vises.—Solid Box, Trenton..... ₩ ℔ 11¼ @ 12½c net

Wrenches.—
Girard (Coe's Pattern).....dis 50&10 %, case 50, 10&5 %
Agricultural—
₩ doz 10 in., $3 60; 12 in., $5 40 net; case dis 5 %
Coes' Genuine.....dis 50&10 %
" Pat. Wrot Bar .....dis 60&10 %
" " Mall " .....dis 75&10 %
Taft's " Wrot " .....dis 75 @ 75&10 %
Phila. Tool Co., Duplex.....dis 25 %

Wire.—
Bright or Ann'd, No. 0 to 18.....dis 57½ @ 60 %
" " No. 19 to 26.....dis 60 @ 62½ %
" " No. 27 to 36 .....dis 62½ @ 65 %
Tinned Broom Wire.....dis 45 @ 47½ %
Galvanized, No. 7 to 18 .....Market list, dis 30 @ 35 %

Wringers.—Novelty No. 10.....₩ doz. $60 00 net
Novelty No. 2 " 63 00 net
Universal, No. 2¼ " 60 00 net
" No 3. " 63 00 net

PITTSBURGH.

Merchant Iron.

Flat Bar.

1½ to 4x⅜ to 1 in.....1.80c
4¼ to 6x⅜ to 1 in.....1.90c
1¾ to 6x1¼ to 1½ in...2.20c

Rounds and Squares.

1 to 1¾ in.....1.80c
2 to 2⅝ in.....2c
2⅝ to 3¼ in.....2.30c
3⅜ to 4 in.....2.80c
⅝ to 1⅞ in.....1.90c

Horse Shoe Bar—all sizes.....2.80c

Heavy Bands.

3½ to 6x¼ and 5-16 in. 2c
1½ to 3¼x¼ & 5-16 in. 2c

Light Bands.

3 to 6x⅛ to 3-16 in.....2.10c
1½ to 2⅝x⅛ to 3-16 in...2.30c
Same sizes X No. 11 and No. 12 2-10c. extra.

Hoop Iron.

⅝ & 9-16, Nos. 13 to 16...4.50c
⅝&11-16, Nos. 13 to 16.. 4c
⅞&13-16, Nos. 13 to 16..3.50c
1 & 1⅛, Nos. 13 to 15..3.10c
1¼ to 2, Nos. 13 to 15..2.70c
1⅝ & 9-16, Nos. 13 to 20..4.80c
¾ & 11-16, Nos. 17 to 20..4.30c
⅛ & 13-16, Nos. 17 to 20..3.80c
1 and 1⅛, Nos. 16 to 19..3.40c
1¼ to 2, Nos. 16 to 18..2.90c
2¼ to 3½, Nos. 13 to 15..2.80c
The prices under Hoop Iron do not apply to Cotton Ties.
1-10c ₩ ℔ extra for each gauge lighter.

Oval Iron.

⅞ to 1¼ in.....2.20c
⅝ to ¾ in.....2.40c

Half Oval & Half Round

⅞ to 1¼ in.....2.50c
⅝ to ¾ in.....3c

Sheet Iron.

	Com'n.	Chare'l
No. 10 to 14	2.60c	4.10c
No. 15 to 17	2.80c	4.30c
No. 18 to 21	3.10c	4.60c

All Sheets, No. 18 and lighter, over 30 in. wide, not less than 2-10c. extra.

Wood's Patent Planished Sheet.

1st quality (A).....10½c | 2d quality (B).....9½c

Plate Iron—3-16 to ⅜ in. thick.....2.60c

Galvanized Iron-Juniata.

Nos. 14 to 20.....12c | No. 27.....15c
Nos. 21 to 24.....13c | No. 28.....16c
Nos. 25 and 26.....14c | No. 29.....18c
Common and imperfect Juniata, 45 to 50 % off. Discount, 30 to 40 %.

Roofing Iron, Corrugated or Crimped.

Galvanized Common.		Black.	
No. 20.....	7c, net cash	No. 20.....	4c
No. 21 to 24..7¼&8c,		Nos. 21 to 24.....	4¼c

Bridge Iron.
Carnegie Bros. & Co.'s list.

Beams and Channels.

Solid Wrought Iron Beams, 3 to 10½ in. x 30 ft..₩ ℔ 3 c
" " " " 12 in. by 25 ft..... " 3
" " " " 15 in. by 25 ft..... " 3¼c
Deck Beams, 7 to 9 in. by 30 ft..... " 3 c
Channel Bars, 1¼ to 10 in. by 30 ft..... " 3 c
" " 12 in by 30 ft..... " 3¼c

Tee Iron.

1 in. x 1 in. to 5 in. x 3 in.....₩ ℔ 2.90

Angle Iron.

Equal Sided, 1x1 to 1¾x1¾ in.....₩ ℔ 2.70
" 2x2 to 4x4..... " 2.60
Unequal Sided, 2x1¾ to 5x4..... " 2.60
Square Root Angles, 2x2 to 3½x3½..... " 2.60
Star Iron, 1¾x1½ to 4x4..... " 2.70
Sash Iron, 1¾x⅞x3-16..... " 3.20c
Miscellaneous Shapes, various shapes...₩ ℔, 2.6 to 3.5c

Nails.
Fence and Brads.

10d to 6od	$2.50	4d and 5d	$3.25
8d and 9d	2.75	3d	4.00
6d and 7d	3.00	2d	5.25

Barrel.

¾ in.	6.50	1⅛ in.	4.25
⅞ "	5.50	1¼ "	4.00
1 "	5.00	1½ "	3.50
		1⅝ "	3.25

Lining.

⅞ in.	7.00	¾ in.	8.50

Tobacco Hhd.

10d	3.00	8d	3.25
		6d and 7d	3.50

Clinch—All sizes.....4.25

Slating.

5d	3.50	3d	4.25
4d	3.50	2d	5.50

Finishing.

1 in.	7.50	1½ to 1¾ in.	4.50
1¼ "	6.50	2 in.	4.25
1⅜ "	4.75	2½ "	4.00
		3 " and over.	3.75

Casing and Box.

10d to 30d	3.25	6d	3.75
8d	3.50	4d	4.00
		3d	5.00

Fine Blued.

4d	4.25	3d	5.50
		2d	6.25

Cut Spikes—All sizes.....2.75

Boat Spikes—All sizes.....3.25
Each half keg 10 cents extra.

TERMS.—Note or acceptance at 60 days; or a discount of 2 per cent. for cash, if remitted within 10 days from date of invoice. An abatement of 10 cents per keg allowed upon orders of 200 kegs or over.

Steel.
Square, Flat and Octagon Tool Steel.

⅜ to 2 in.	13c	7-32 and 4¼ 5 in.	16c
5-16 and 2½ to 3 in.	14c	3-16 and 5¾ to 6 in.	19c
¼ and 3¼ to 4 in.	15c	5-32 in.	24c

Single and Double Shear Nailers—Same as Tool.
Knife, Tap, Die, Mill Pick, Drill—Ordinary sizes.....13c

Machinery Steel—Round.

⅜ to 2 in.	7½c	7-32 and 4¼ to 5 in.	10½c
5-16 and 2½ to 3 in.	8½c	3-16 and 5¾ to 6 in.	13½c
¼ and 3¼ to 4 in.	9½c	5-32 in.	18½c

Cast Spring Steel.
1 to 4x¾ to ⅛ in..... 6½c | ⅞ to 1¾x¾-32 to 3-16 in...8½c

Agricultural Steels.

Solid Cast Steel Plow, 4 to 16 by 3-16 to ¾ in..... 7c
" Iron Center Plow," 4 to 16x3-16 to ¾ in..... 8c
" Iron Back Plow," 4 to 16x3-16 to ⅝ in..... 8½c
Soft Steel Center Plow, 4 to 16x3-16 to ⅝ in..... 9c
Landside and Cultivator, C. S., ⅝ in. thick..... 9½c
Circular Plow Coulters, 5-32 to ¼ in. thick..... 11c
Reaper and Scythe..... 13c
Fork and Hoe..... 7c
Horse Rake Teeth, to length..... 8c
Finger Bar..... 8½c
Cutter Bars, C. S..... 8½c
" German Spring Steel..... 7½c
Cornstalk Cutter beveled to length..... 8c
Planters' Hoe, C. S..... 9c
Hoe, C. S..... 7½c

Sheet Steels.

German, 10 to 16 g.....	8c	Common C'st, 17 to 20 g.	10c
" 17 to 20 g.....	11c	Best Cast, 10 to 16 g...	13c
Common C'st, 10 to 16 g.	9c	" " 17 to 20 g.....	14c

Rolls and Castings.

Furnace, Floor and Straightening Plates.....1¾ @ 2c
Housings and Castings not otherwise specified.....2½c
Guide Plates..... 3 c
Spindles and coupling boxes.....2 @ 2½c
Sand Rolls and Pinions, large size..... 2½c
" " small size..... 3 c
Pipe Mill Castings..... 4 c
Rolling Mill Castings under 50 lbs..... 3 c
Spur and Bevel Wheels, large..... 3 @ 3½c
" " small..... 4 @ 4½c
Pulleys up to 30 inches..... 4 c
" over 30 inches..... 3¾ @ 3½c
Engine Castings, light..... 3½c
" " heavy..... 3¾c

Chilled Rolls.

6 to 7 in. diam.,	7 to 20 in. long		6 c
8 to 15 in. "	8 to 40 in. "		5 c
15 to 24 in. "	15 to 72 in. "		4 c
24 to 31 in. "	72 to 108 in. "		4½c

Heavy Hardware.

Bolts, Screws, Nuts, etc.

Lewis, Oliver & Phillips, discount off Standard List.
Carriage & Tire Bolts, ordinary orders 75, & 3 % off net
Stove Bolts.....40&5 % off net
Elevator Bolts.....30 % off net
Machine and Square Head Bolts.....60&10 % off net
Coach and Lag Screws.....60&10 % off net
Bolt Ends.....60&10 % off net
Pat. Hot Pressed Sq. and Hex. Nuts.....80 ₩ ℔ off net
Washers, all made from new band iron..80 ₩ ℔ off net
Nuts and Washers in 25 ℔ boxes, ½c ₩ ℔ ex. Nuts and Washers in lots less than one keg each size, ½c ₩ ℔ ex. Nuts and Washers in 5 ℔ boxes, 1c ₩ ℔ ex.
Strap and T Hinges.....60&12½ % off net
Harrow Teeth.....net
Skein Bolts.....net
Cast Iron Washers.....3½c ₩ ℔ net
Fire Shovels and Pokers.....50 % off

Wagon Hardware.

Single Trees, Neck Yokes and Double Trees, made from best selected hickory, and ironed complete, in the most approved patterns.
No. 1 Southern Plow Single Tree, Ironed complete, Irons all Wrought.....each, 25c net
No. 2 Western Plow Single Tree, Ironed complete, Irons all Wrought.....each, 35c net
No. 3 Wagon Single Tree, Iron complete, Irons all Wrought, except Malleable Ferrule.....each, 50c net
No. 4 Wagon Single Tree, Ironed complete, Irons all Wrought; Improved End Pieces riveted on; one side acts as a wear iron for wheel to rub against.....each, 50c net
Neck Yoke, Ironed complete, Irons all Wrought except End Ferrules, with Wt. Iron Rings.....each, 60c net
Southern Plow Double Tree, Ironed complete, Irons all Wrought.....each, 50c net
Wagon Box Strap Bolts—
For orders of 100 Set, 45&10 % dis.

10 in.	long by	7-16	at Screw End,	₩	set of	8	bolts.. 45c
12 in.	"	½	" "	"	"	8	" .. 55c
10 in.	"	9-16	" "	"	"	8	" .. 65c
12 in.	"	9-16	" "	"	"	8	" .. 70c
14 in.	"	9-16	" "	"	"	8	" .. 80c
10 in.	"	⅝	" "	"	"	8	" .. 80c
12 in.	"	⅝	" "	"	"	8	" .. 90c
14 in.	"	⅝	" "	"	"	8	" .. 1.00
16 in.	"	⅝	" "	"	"	8	" .. 1.00
18 in.	"	⅝	" "	"	"	8	" .. 1.10
20 in.	"	⅝	" "	"	"	8	" .. 1.20

4c ₩ set for each additional inch over 14 inches. All lengths made.

Chains, Straight or Twist Link.
Reiter & Morton's List.

5-16	7c	⅜	6¾c
⅜	6c	9-16	5¼c
7-16	6c	⅝	5c

Net cash, 30 days.

Horse Shoes, Etc.—In 100 keg lots.
Juniata Horse Shoes.....per keg, $3.25
" Mule " 4.25
Steel Toe Calks.....per 7½c lb.
Thistlewood & Co.'s Self-Sharpening Horse Shoes.....per keg, $5.25
Thistlewood & Co.'s Self-Sharpening Snow Shoes..... " 5.50
Toe Calks.....per lb. 8c

White and Red Lead.
Assorted Kegs (all sizes).....8c
25 ℔ Tin Pails, 100 ℔ Cases.....8½c
12½ ℔ Tin " " 9c
Red Lead.....in kegs, 7¼c; in barrels, 7½c.
Orange Mineral..... " 100 ℔ 9¼c.
Litharge..... " 7¾c; " 7½c.
Dry White Lead..... " 7¾c; " 7½c.

Window Glass.
Per Box of 50 Feet.—Discount 70 % @ 70&10 %.

Single Strength.

Size.	AA.	A.	B.	C
6 x 8 to 10 x 15	$7.50	$6.75	$6.25	$5.7
11 x 14 to 16 x 24	8.50	7.75	7.25	6.5
18 x 22 to 20 x 30	10.75	9.75	8.75	7.7
15 x 36 to 24 x 30	12.25	10.75	9.00	
26 x 28 to 24 x 36	13.00	11.50	9.75	
26 x 36 to 26 x 44	14.50	13.25	10.75	
26 x 46 to 30 x 50	15.00	14.00	11.25	
30 x 52 to 30 x 54				
30 x 56 to 34 x 56				
34 x 58 to 34 x 60				
36 x 60 to 40 x 60				

Double Strength.

6 x 8 to 10 x 15	12.00	11.00	10.00	2?
11 x 14 to 16 x 24	13.75	12.50	11.75	10.50
18 x 22 to 20 x 30	17.25	15.75	14.00	
15 x 36 to 24 x 30	19.75	17.25	14.50	
26 x 28 to 24 x 36	21.00	18.50	15.75	
26 x 36 to 26 x 44	23.25	21.25	17.25	
26 x 46 to 30 x 50	24.00	22.50	18.00	
30 x 52 to 30 x 54	26.75	23.25	19.25	
30 x 56 to 34 x 56	27.75	25.00	21.75	
34 x 58 to 34 x 60	29.25	27.75	24.00	
36 x 60 to 40 x 60	33.25	30.00	27.75	

An additional 10 per cent. will be charged for all glass more than 40 inches wide. All sizes above 52 inches in length and not making more than 81 united inches, will be charged in the 84 united inches bracket.

CHICAGO.

(The Chicago Stamping Co., 72, 74 & 76 Lake St.)
Jan. 16, 1878.

Tin Plate.—

10x14, IC, Ch'l. Good.&		14x20, IXX, Ch' Best.	12 00
10x14, IC, " Best.	7 00	14x20, IXXX, " " .	14 50
10x14 IX, " " .	9 50	DC, 100 Plate " " .	7 00
12x12, IC. " "	7 00	DX, " " .	9 50
12x12, IX, " " .	9 50	DXX, " " .	12 00
14x20, IC, " "	7 00	DXXX " " .	14 50
14x20, IX, " " .	9 50	IC, Roofing, " " .	6 75
20x28, IC, Charcoal Roofing, Good....		IX, " " .	9 25
20x28, IC, " Best			14 00
20x28, IX, " "			18 50
10x14, IC, Coke Plates			6 50
14x20, IC, "			6 75
10x20, IC, "			10 50

Block Tin.—

Large Pigs	20c	Bars.....	22c
Small.....	21c		

Zinc.—Sheet, 500 to 1000 ℔. Casks..... 6½c
Loose Sheets..... 7 c
Slab Zinc or Spelter..... 6 c

Copper.—Bottoms..... 29c
Sheathing..... 26c
Planished..... 31c
" Boiler lengths 36c
Bolt 28c

Brazier's Sheets.—

30x60, 6 to 7 lbs....	₩ ℔ 34c	30x60, 10 to 12 lbs...	₩ ℔ 30c
30x60, 8 to 9 lbs.....	" 32c	30x60, 15 to 100 lbs.	" 28c

Solder.—F. S. & Co.'s make
Best Fine..... 15c
No. 1..... 14c
Roofing..... 12c
Braziers or Shaver Solder..... 30c

Antimony..... 16c

Rabbit Metal—F. S. & Co.'s..... 12c
No. 2..... 10c

Sheet Iron.—

	Common.	Smooth. Com.	Smooth Charcoal.	Smooth Juniata
No. 24.....	3·20c	4·20c	6 c	8 c
25 & 26...	3·40c	4·40c	6¼c	8¼c
27.....	3·60c	4·60c	6½c	8½c

Galvanized Iron.—dis 40 %

No. 16 to 20	12c	No. 27	13c
21 to 24	13c	28	16c
25 & 26	14c		

Russia Iron.—Perfect..... 12½c | No. 1 Stained..... 11c
In Sheets, 1c. higher.

American Russia.—A..... 11c | B..... 9½c
In sheets, 1c higher

Lead.—Pig..... 5 c | Lead Pipe, in full coils 6
Bar..... 6 c | Lead Pipe, when cut.. 6¼
Sheet Lead..... 6½

Wire—Bright..... dis 50 %
Coppered..... dis 45 %

AMERICAN MANUFACTURES FOR EXPORT.

Machines, Tools, Axles, Springs, Carriage Hardware, Carriage Woodwork, Hubs, Spokes, Felloes, Rims, Shafts, Poles, Hardwood Lumber,

AND ALL ARTICLES MADE FROM

Wood, Iron or Metals.

Guy C. Hotchkiss, Field & Co.

74 to 85 First St., AND 1 to 11 S. 9th St., } BROOKLYN, E. D.

527 Hudson St., AND 250 Water St., } NEW YORK.

FOR MELTING ALL KINDS OF METALS,

And Manufacturers of

Sunny Side Stove Polish.

Lumber Pencils, Foundry Facings and Lubricating Plumbago.

WILE, SIEDEL & CO.,

Nos. 1324, 1326, 1328, 1330, 1332 & 1334 Callowhill St., Phila.

GENERAL AGENTS:

Messrs. HALL & CARPENTER, 709 Market St., Phila.

ALEXANDER BROS.

WM. F. FOREPAUGH, JR. & BROS.

Manufacturers of SUPERIOR OAK TANNED

LEATHER BELTING.

Best Quality Lace and Strap Leather on Hand, Rivets, Belt Hooks, Dubbing, &c.

N. W. Cor. Randolph and Jefferson Sts., PHILADELPHIA.

☞ All Belts Warranted. Orders by Post immediately attended to.

Morse Twist Drill and Machine Co.,

NEW BEDFORD, MASS., Sole Manufacturers of

Morse Patent Straight-Lip Increase Twist Drill,

Beach's Patent Self-Centering Chuck, Solid and Shell Reamers.

BIT STOCK DRILLS,

Drills for Coes, Worcester, Hunter and other Hand Drill Presses. Beach's Patent Self-Centering Chucks, Center and Adjustable Drill Chucks, Solid and Shell Reamers. Drill Grinding Machines. Taper Reamers, Milling Cutters and Special tools to order.

All Tools exact to Whitworth Standard Gauges.

GEO. R. STETSON, Supt. EDWARD S. TABER, Treas.

D. W. Hazelton & Co.,

724 Girard Ave., PHILADELPHIA, PA.,

MANUFACTURERS OF

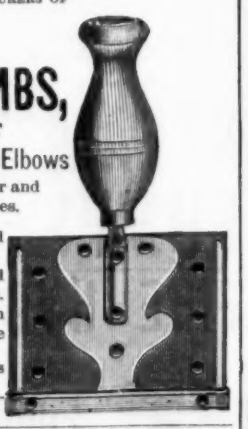
CURRY COMBS,

PATENT

Adjustable Lock Elbows

for Stove, Heater and Conductor Pipes.

Flat and Rimmed Wash Boiler Covers.
Stamped Ware and Wood Frame Graters.
Pat. Metallic Wash Boiler and Kettle Bottoms.
Stamped and Press Work to order.
Correspondence solicited.



BROWNING'S

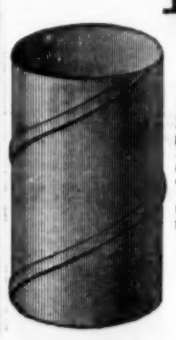
Patent Self-Adjusting Pipe Tong, Wrench and Ratchet Drill.

This tool is made on an entirely new principle, and is pronounced superior to any tool made for the purpose.

JOSEPH BROWNING,
Manufacturer, 2554 Callowhill St., Philadelphia.

FOR SALE.

Patents of Root's Wrought Iron Spiral Pipe.



The Abendroth & Root Manufacturing Company, sole owners of the Letters Patent, and manufacturers under the same, of Root's Spiral Metallic Tubing, grooved and riveted seam, now offer for sale the territory west of the Rocky Mountains, in the United States, and the Letters Pat

Bucket Plunger.

Wright's Patent.

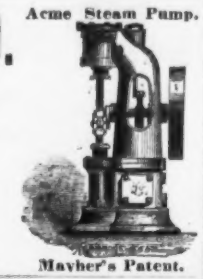
VALLEY MACHINE CO.

STEAM PUMP

Manufacturers,

Easthampton, - Massachusetts.

Acme Steam Pump.



Mayher's Patent.

ESTABLISHED 10 YEARS.

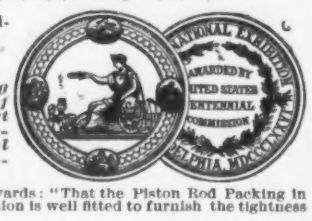
Empire Gum-Core Packing.

Patented Dec. 27th, 1870, and April 4th, 1871.

Trade Mark, Pat. July 4, 1870.

The First Self-Lubricating Gum-Core Packing.

The only one receiving Medal, Certificate of Award, and Report from Judges at Centennial International Exhibition, at Philadelphia in 1876.



Report of Judges on Awards: "That the Piston Rod Packing in composition and combination is well fitted to furnish the tightness and elasticity required."

We have scores of testimonials from reliable parties who have used the "**Empire**" from **five** to **ten years**, and give a few samples; but the **best** evidence of its being the **very best in the market**, is the fact that so many unscrupulous parties are **imitating** it as near as they dare, and trying to make sales for their cheap material on the reputation of the "**Empire**," representing to have something equally as good at a lower figure, always making the "**Empire**" the basis of operations.

FAIRMOUNT WATER WORKS, Phila., May 8, 1871.
Messrs. Wm. M. Canfield & Co.—GENTLEMEN: We have now used your Empire Packing in the pumps of these works the past three years. We have run the same Packing without renewal for 18 months; the time saved in stopping to repack has more than twice paid for the Packing used. It is the best Packing ever invented.
JOSEPH MOYER, Engineer.

N. B.—Still in use here, making a service of 10 years.

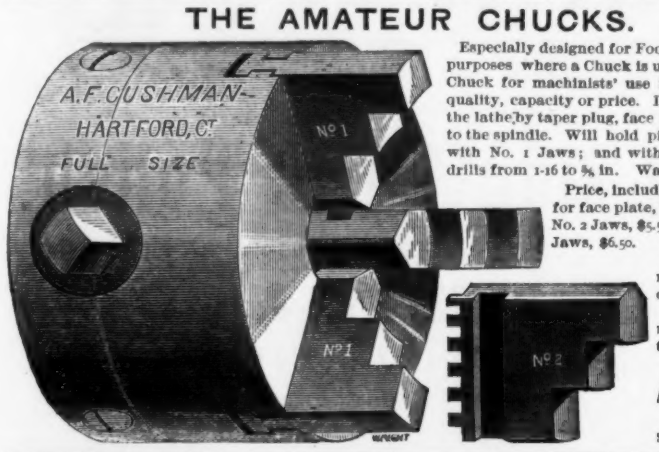
NEW BRITAIN, CONN., Sept. 24, 1874.
Messrs. Wm. M. Canfield & Co.—GENTLEMEN: Please send us by cheapest freight route, 10 feet 1¼ Empire Packing, same as sent us about two years ago. We have had in use one set of Packing of above size since January 1st, 1873, and when taken out last night was in good condition, and looked as though it would last an indefinite amount of time. We had to remove it in order to make repairs to our engine. Please send above at once and oblige, Yours truly, P. & F. CORBIN.

The claims of the "Empire" to superiority are firmly established, and it is fast superseding all other kinds of Packing. It is alike adapted to Stationary, Locomotive and Marine Engines, Hot and Cold-Water Pumps.

☞ Write for new discounts to dealers and consumers.

CANFIELD MANUFACTURING COMPANY,
127 N. Seventh St., Philadelphia, Pa.

THE AMATEUR CHUCKS.



Especially designed for Foot Lathes and for all purposes where a Chuck is used; and as a Drill Chuck for machinists' use it has no superior in quality, capacity or price. Is made to attach to the lathe by taper plug, face plate, or to screw on to the spindle. Will hold pieces 2¼ in. diameter with No. 1 Jaws; and with No. 2 Jaws will hold drills from 1-16 to ⅝ in. Warranted satisfactory

Price, including Key and Screws for face plate, with either No. 1 or No. 2 Jaws, $5.50. With two sets of Jaws, $6.50.

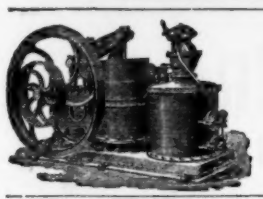
One sample sent by mail free on receipt of price.

Price to dealers furnished on application.

Address

A. F. Cushman,
HARTFORD, CONN.

Send for catalogue.



BROWN'S CALORIC ENGINE.

Superior to any Hot Air Motor in Market.

Is the most perfect substitute for any other power. Its special merits are: Simple construction and durability. The consumption of fuel is about 2¼ pounds per horse-power and per working hour. Accidents of explosive nature are impossible. No water tax. No extra insurance. Replenishing the self-feeder does not cause any stoppage or slacking of the power. These machines can be seen in sizes of 3½, 7 and 14 horse power, at the

BROWN CALORIC ENGINE CO., 57, 59 & 61 Lewis St., N. Y.

Larger sizes per contract. Apply for illustrated price list.

Aug. P. Brown's Safety Steam Engine Governor.

Apply for circular. 57, 59 and 61 Lewis St., New York.

The Stamped Stove Pipe Elbow,

HOGEN'S PATENT.

The Stamped Elbow has neither Crimps, Cavities nor Angles which cause accumulations that rust or corrode the Iron.

OFFICE AND WORKS, Wason St. on Lake Shore, CLEVELAND, O.

RICHARD DUDGEON.

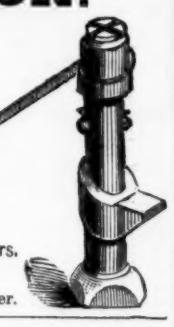
No. 24 Columbia Street, New York,

Maker and Patentee of the Improved

Hydraulic Jacks

AND

Punches.



Roller Tube Expanders and Direct Acting Steam Hammers.

Communications by letter will receive prompt attention.

Jacks for pressing on Car Wheels or Crank Pins made to order.

MICROMETER CALIPER,

Made by THE VICTOR SEWING MACHINE CO.

Middletown, Conn.

This attractive and very desirable tool will be found more reliable and convenient than the Vernier Caliper, and to Machinists and Tool makers it is indispensable on work requiring very accurate and close measurement. Its capacity is one inch, and is graduated to one thousandths, but can readily be set one-half and quarter thousandths; and is so constructed that any wear resulting from use can be readily adjusted.

Ludlow Valve Mfg. Co.,

OFFICE AND WORKS:

938 to 954 River St. & 67 to 83 Vail Ave., Troy, N. Y.,

VALVES

(Double and Single Gate, ¼ in. to 48 in.—outside and inside Screws, Indicator, &c. for Gas, Water and Steam. Send for Circular.

Also FIRE HYDRANTS.

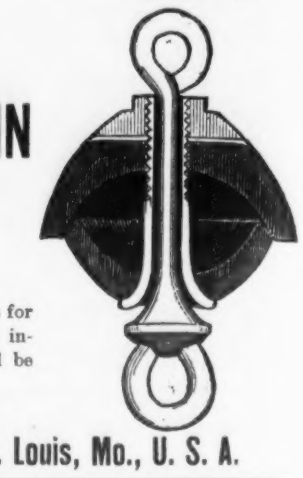
L. M. RUMSEY & CO.,

SOLE OWNERS AND MANUFACTURERS OF

Witherell's and Churchill's Patent

RUBBER BUCKETS, PUMP CHAIN AND FIXTURES

For Chain Pumps.

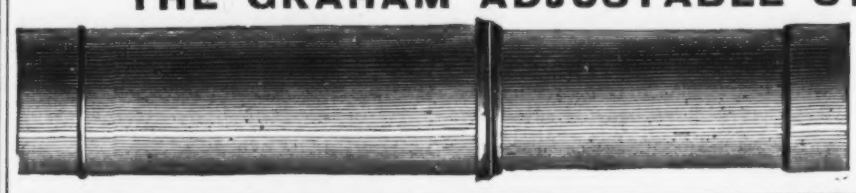


These Patents cover the use of the Rubber, the use of the Nut and Bolt for expanding, the use of the Tube and Valve for draining. All others are infringements, and manufacturers and dealers in infringing Buckets will be prosecuted to the full extent of the law.

For Rubber Buckets, Chain Tubing, Curbs and Fixtures, address

L. M. RUMSEY & CO., 811 North Main Street, St. Louis, Mo., U. S. A.

THE GRAHAM ADJUSTABLE STOVE PIPE.



(Pat. Jan. 9, 1877.)

Medal Awarded at American Institute, 1877.

Sidney Shepard & Co.,

Sole Manufacturers,

BUFFALO, N. Y.

THE EAGLE ANVIL!! WARRANTED!!

(ESTABLISHED) 1843.

These Anvils are *superior* to the best English, or other Anvils, on account of the peculiar process of their manufacture (invented and used only by this concern), and from the quality of the materials employed.

The best English Anvils become hollowing on the face by continued hammering in use, on account of the fibrous nature of the wrought iron—causing it to "settle" under the face.

The body of the Eagle Anvils is of crystallized iron, and no settling can ever occur; the steel face, therefore, remains perfectly true. Also, it has the great advantage, that being of a more *solid* material, and consequently with less rebound, the piece forged receives the full effect of the hammer, instead of a part of it being wasted by the rebound, as of a wrought iron anvil. An equal amount of work can, therefore, be done on this Anvil with a *hammer one-fifth lighter* than that required when using a wrought iron anvil.

The working surface is in *one piece* of JESSUP'S BEST TOOL CAST STEEL, which, being accurately ground, is hardened and given the proper temper for the heaviest work. The *horn* is covered with and its extremity made *entirely of steel*. The body of the Anvil is of the strongest grade of American iron, to which the ca steel face is *warranted to be thoroughly welded and not to come off*.

Price List, October 1st, 1876. ANVILS weighing 100 lbs. to 800 lbs., 9c. per lb. Smaller Anvils, ("Minims,")

No.	00	0	1	2	3	4	5	6	7	8	9
Weighing about	5 lb.	10 lb.	15 lb.	20 lb.	30 lb.	40 lb.	50 lb.	60 lb.	70 lb.	80 lb.	90 lb.
	$2·25	$2·75	$3·25	$4·00	$4·50	$5·25	$6·00	$6·50	$7·25	$8·00	$8·50

N. B.—These are the RETAIL PRICES. The only additional cost will be the freight to the purchaser's place of residence.

THESE GOODS ARE SOLD BY THE GENERAL AGENTS (with special discounts to the trades.)

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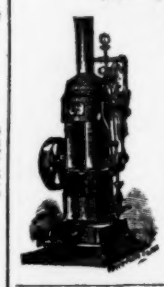
FISHER & NORRIS, Sole Manufacturers, Trenton, N. J.

ESTABLISHED 1844.

JOSEPH C. TODD,

(Formely of TODD & RAFFERTY)



Engineer & Machinist

Flax, Hemp, Jute, Rope, Oakum and Bagging Machinery, Steam Engines, Boilers, etc.

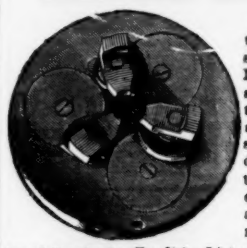
I also manufacture

BAXTER'S

New Portable Engine

of 1877, of one horse-power, complete for $125; can be seen in operation at my store. I will furnish specifications and estimates for all kinds of Machinery. Send for descriptive circular and price. Address **J. C. TODD,** 10 Barclay St., N.Y., or Paterson, N. J

JOHNSON'S PATENT UNIVERSAL LATHE CHUCK.



We invite attention to the superior construction of this chuck. Its working parts are **absolutely protected from dirt and chips.** It is strong, compact and durable, and will hold the greatest variety of work, as the jaws are adjustable with a range the full diameter of the chuck. For Price List address

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FOR

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FINE TOOLS

for Machinists and Amateurs; Barnes' Foot Power Scroll Saw; Foot Lathes all kinds. Sole Agents Baxter Steam Engine. Iron and Wood Working Machinery. Send for Price Lists.

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FIRE HYDRANTS

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Eddy Valves.

All Styles and Sizes.

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THE MOHAWK & HUDSON MFG CO.,

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H. S. MANNING & CO.,

Sole Sales Agents for **THE MORSE TWIST DRILL AND MACHINE CO.'S**

Manufacture of Patent Machine Relieved Nut, Hand, Blacksmith and Machine Screw Taps, Screw Plates, Tap Wrenches and Patent Relieved Pipe Taps and Pipe Reamers, also of Solid Bolt and Pipe Dies. Furnished either in **V** or U. S. Standard shape of threads.

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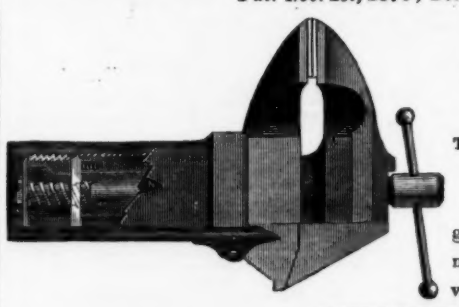

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The Best Rapid Adjustable Vise in the Market.

Simple and durable. No chance of getting out of order. No toggle or cam movements or parts. A trial will convince.

MANUFACTURED BY THE

TRENTON VISE & TOOL WORKS, Trenton, N. J.

Address orders to

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PORTABLE DRILLS. Driven by power in any direction.
RADIAL DRILLS. Self-feed—Large Adjustable Box Table.
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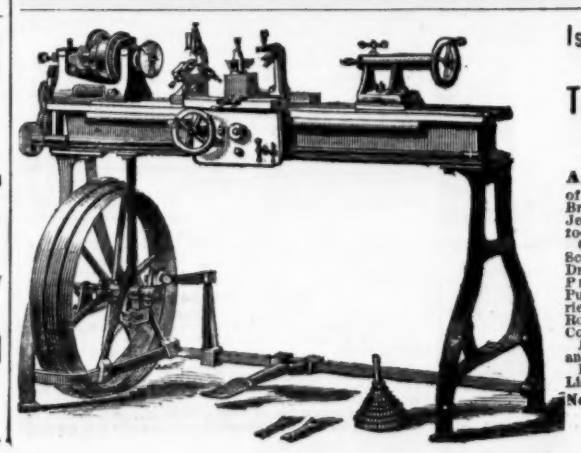
MULTIPLE DRILLS. 2 to 20 Spindles.
HORIZONTAL BORING AND DRILLING MACHINES.
HAND DRILLS. CAR BOX DRILLS.
SPECIAL DRILLS. For Special Work.



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Manufacturers of

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And Their Attachments,

of every variety, for Machinists, Brass Finishers, Wood Turners, Jewelers and Amateurs, to run by foot or steam power.

Crank Shapers, Buffing Machines, Screw Machines, Turret Heads, Drop, Screw, Lever and Mandrel Presses, Screw and Eccentric Punches, Screw Clamps, Lathe Carriers, Reamers, Taps, Dies, &c.; also Rotary Circulating Fans, Shafting Couplings, Hangers, Pulleys, &c.

Designing and Building of New and Special Tools and Machinery.

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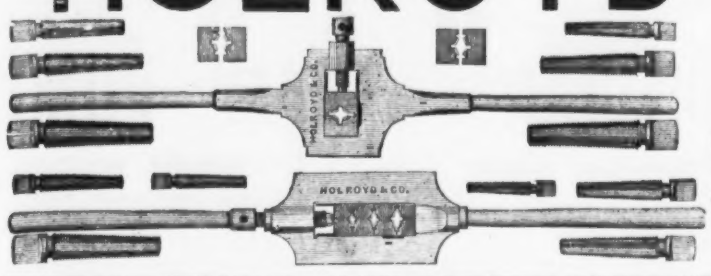

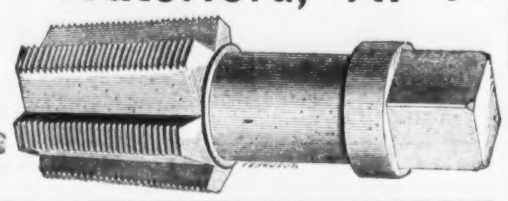

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At Lowest Prices.

Price, $54.00 per dozen.

No. 10, Family Size, with Cog Wheels.
Price, $60.00 per dozen.

No. 2, Iron Frame, Self-Adjusting.

F. F. ADAMS & CO., Erie, Pa.

CLARK'S PATENT EXPANSIVE BITS

Made of JESSOP'S BEST CAST STEEL, and warranted superior to any other
Two sizes: Large Size Boring, ⅞ to 3 inches; Small Size Boring, ½ to 1⅛ inches.

Manufactured by

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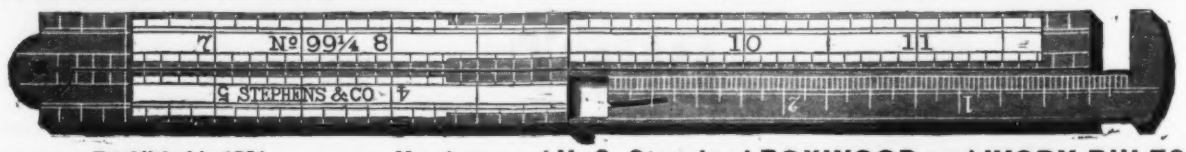

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Also Exclusive Manufacturers of L. C. STEPHENS' PATENT COMBINATION RULE.
Rules graduated in foreign measure to order. RIVERTON, CONN.
H. DURRIE & CO., New York Agents, who will supply the trade at factory prices.

1865. **PEERLESS WRINGER COMPANY.** 1878.

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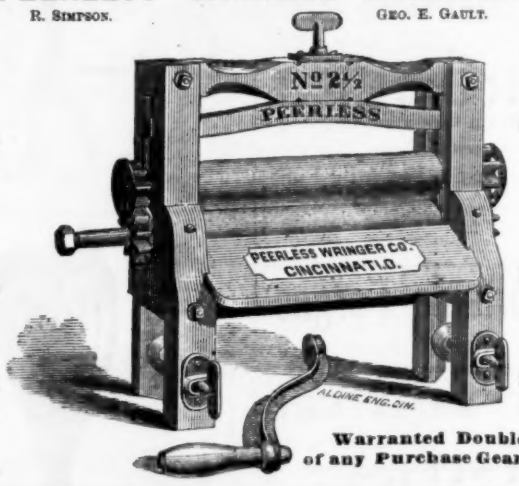

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WARRANTED CAST STEEL

SAWS

Of every description, including

Circular, Shingle, Cross-Cut, Mill, Hand, WOOD SAWS, Etc., Etc.

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Manufacturer of every kind of

Patent Ground SAWS.

TRADE MARK. HARVEY W. PEACE & Co.

Circulars, Cross-Cuts, Mill Mulay, Gang, Hand and Butcher. Molding and Planing Knives Plastering Trowels, Mitering Rods, &c.

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Movable Toothed Circular Saws,

PERFORATED CROSS-CUT SAWS

And SOLID SAWS of all kinds. Trenton N. J.

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Shovels, Scoops AND SPADES,

Without Welds or Rivets.

Made only of the

BEST CAST STEEL.

Every one branded in the Steel, "E. REMINGTON & SONS." None others genuine.

Plows, Hoes, Garden Rakes, Horse Rakes, Mowers and Agricultural Implements generally.

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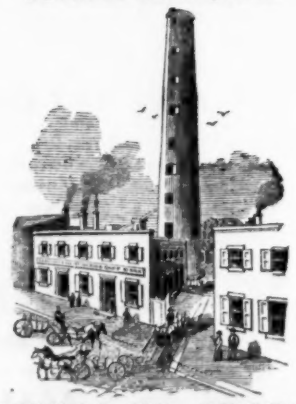
The Oldest Shot Tower in America.

FOUNDED JULY 4, 1808.



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American Chilled Shot,

Rivaling the English and all Others.

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FINE GRAY IRON CASTINGS of all kinds made to order.

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Reported by Macomber, Bigelow & Dowse, 156 to 164 Oliver St.

Anvils.—"Eagle American".....per lb. 9c: dis 20 %
Anvils and Vise (combined).
No. ..... 1, $4·50; 2, 3·75; 3, 3·00 each, dis 25 %
L'Hommedieu Ship.....dis 15 %
Axes.—Blue Jacket..... 9 00
Racer..... 8 00
Red Cross, Handled..... 10 50
" " Boy's..... 9 00
Blue Jacket " 10 00
Axe Handles.—Wadleigh's Oak—
A (Extra) $2·50. B (No. 1) $2·00. C (No. 2) $1·50 ₩ doz
Blind Hinges.—Orr or Washburn's..₩ hun d sets $6 50
Blind Pasts.—
Orr or Washburn's.....per hundred set $4 50
Bolts.—Carriage, Phila.....dis 60&20 %
Carriage Common.....dis 75 %
Borax.—Best Refined.....₩ lb 10c
Borers.—Angle, Backus'.....dis 50 %
Boring Machines.—Angle.....each $4 50
Common, Snell's quality.....each 3 50
Braces.—Barber's..... dis 40&5 %
Backus'.....new list 50&10
Spofford's.....dis 50 %
Bracket
Saw Frames, with patterns complete.....₩ doz $5 50
Saws..... " 88
Star Bronzed.....new list net
Star Japanned.....new list net
Store Shelf.....new list net
Brass Faucets.—L. F. & C.....dis 40 %
Brushes.—Horse, Patent Metallic.....per doz. $4·50
Butts.—Union Drilled Loose Joint.....dis 66⅔ & 10%
" " Wire Fast Joint..... dis 50&10 %
" " Acorn Loose J't.....dis 65&10 %
Brass Butts.....dis 30 %
Wrought Table Butts and Back Flaps
.....revised list, dis 35 %
Wrought Narrow Butts.....reduced, dis 40 %
Cards.—
Curry Cards No. X, per doz., $0·65. .....dis 30 %
Horse No. X, " 0·80.....dis 30 %
Wool No. 8X, " 2·50.....dis 15 %
Cotton " No. 10, " 3·50.....dis 10 %
Cartridges.—U. S. Cartridge Co.....dis 60 %
Chisels.—"Buck Bros." Shank Goods.....dis 20 %
Socket.....dis 20 %
Compasses and Dividers.—Bemis'.....dis 40 %
P. S. & W.....dis 30 %
Cordage.—Manila (usual trade dis.).....₩ lb 12½c
Corn Hooks.....per doz $2·75
Crow Bars.—Solid Steel.....₩ lb, 9c
Cow Ties.....dis 30 %
Dividers.—Cook's Nickel Plated.....dis 15 %
Door Springs.—Mosely—

Per doz.	$9·00	12·00	15·00	18·00	24·00
No.	0	1	2	3	4

Torrey's.....$2·50
Gem.....dis 10 %
Emery.—Alden.....₩ lb 7c
Wellington Mills.....₩ lb 10c
Files.—American.....dis 35 %
Nicholson, new list.....dis 35 %
Wheeler, Madden & Clemson.....$5 to $; 10 %
Stubb's Tapers, genuine, 3 in., $1·50; 3½, $1·62½, $1·88; 4½, $2 13; 5, $2·50
Hammers.—Maydole—new reduced list.....dis 15 %
M., B. & D., solid cast steel, adze eye, No. 1, $10; 1½, $8·75.....dis 25 %
M., B. & D., solid cast steel, bell face, No. 1 $11; 1½, $9·75.
Hammond—new reduced list.....dis 15 %
Augers & Rollers.—Anti-Friction.....dis 40 %
Climax.....dis 40 %
Acme Rollers.....dis 40 %
Hatchets.—Underhill Edge Tool Co.....dis 25 %
C. F. Dowse, warranted Cast Steel—
Shingling.....0, $4·75; 1, $5·25; 2, $5·75
Claw.....1, $·75; 2, $·25
Lathing.....1, $5·50
Axe Pattern.....1, $7·00 2, 7·50
Broad....0, $5·75; 1, $6·50; 2, $7·50; 3, $9·25; 4, $10·75
5, $12·75 6 $14·75
Hinges.—Strap and T Stanley Works.....dis 60&12½ %
Plate, Loose and Fast Joint.....₩ lb 5c
Wrought Screw Hook.....₩ lb 5c
Knobs.—Imp. Extension Silver'd Glass....₩ doz $8 00
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K. P. & Co. axe finish, long cutter.....$10 00
Short cutter..... 9 50
Pick..... 10 00
Meat Cutters.—"Miles's" Challenge.....dis 50 %
No. 1, $22·00; 2, $30·00; 3, $40·00.
Metal.—Babbitt.....No. 1, 35c; 2, 25c; 5, 15c ₩ lb.
Nails.—100 and larger.....$2 50
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N. Y. Tool Co.....dis 50 %
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Pol. wh't br'zed face No. 115, 1⅝ in., 20c.; 116, 2 in., 26c.
Pulley Blocks.—"Best Boston Make".....ne
Rail Barn Door.—For Novelty and Anti-Friction Hangers.....per foot 7c.. dis 40 %
Refrigerators—Heinz Patent.....dis 25 %
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13 13 14 14 15 16c ₩ lb
Sad Irons.—Bliss & Drake.....₩ lb 2¾c
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M. B. & D.....0 to 2, $4·25; 2 to 3, $4·75
Saws.—*Hand and Panel*—
X Cut, Wheeler, Madden & Clemson.....per ft., 40c
" Champion..... " 45c
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Wood Saws, Welsh & Griffith.....₩ doz $12·00
Wheeler, Madden & Clemson's, same list as "Disston's".....dis. 20 %
Disston's.....dis. 20 %
Saw Horses.—Extra.....₩ doz $2·25
Folding..... " 3·00
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"Willoughby Lake," first quality.....₩ gross $8·50
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Shovels.—O. Ames.....dis 32½ %
M. B. & D.....dis 33⅓ %
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Traps.—Oneida.....dis 30 %
Blake's.....dis 50 %
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Parker's Parallel.....dis 10 %
Backus.....dis 25 %
"Howards," Parallel.....dis 25 %
Wardrobe Hooks.—Wire to drive.....₩ gross $1 00
Weights.—Window Weights.....₩ lb 1½c
Wedges—Axe.....₩ doz 35c
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Eureka in spools, No. 28 to 40 assorted...₩ gross $3 50
Wire Netting.—Clinton Wire Cloth Co., Green, 3½c
Drab or Black.....₩ ft 3½c
Wrenches.—A. G. Coes & Co.....dis 50&10 %
"Girard".....dis 50, 10&10 %
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Universal XX No. 3.....₩ doz $63 00; 2½, 60 00
Novelty, No. 10.....₩ doz 60 00
" No. 2..... " 63 00
" No. 22..... " 67 00
Excelsior.....A, $84 00; B, 94 00; CC, 114 00 ₩ doz
" E, set tubs.....₩ doz 66 00
Eureka..... " 51 00
Wittington, Cooley & Co.—Hoes, Rakes, Forks, &c. dis 40 %. Special rate for Export.

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Corrected weekly by Semple & Birge Mfg. Co.

Animal Pokes.....$6·50 ₩ doz. net
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Axes.—Wm. Mann's, Red Warrior.....₩ doz 9 50
"C. Marshall"..... " 9 00
Handled..... " $5 extra
Double Bitted..... " 19 00
Hunt's..... " 12 00
Axles.—"Jones, Henry & Co.'s" Patent Lubricating, Half Patent Swelled Taper, Plain Taper and Concord Axles.....dis 35 %
Common Axles (Pat. Lubricating), 1⅛ inch and upward.....₩ lb. 5½c
do. less than 1⅛ inch..... " 5½c
Babbitt Metal.

Nos.	4	3	2	1	A 1	Genuine.
	9½	11	16½	20	31	34c ₩ lb.

Bellows.—best St. Louis make, new list.....dis. 15 %
Bells.—Troy, Church, School and Farm Bells..₩ lb 30c
"Improved Amalgam Bronzed" 15 in., $2·00; 17 in., $2·50; 19 in., $4; 21 in., $5; 24 in., $14
Belting.—"Boston Belting Co.'s" Rubber. dis 50&10 %
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Cider Mills.
Buckeye Senior $27·00 Buckeye Junior. 18·00.....net
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Power Shellers.....dis 10 %
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Drag Saw Machines.
Culver's Hod Drag Saw.....dis 30 %
Excelsior Drag Saw with Log Trucks.....dis 30 %
Fanning Mills.—Nash & Cutts.....dis 25 %
Feed Cutters.—Burdick National.....new list, net
Sanford No. 1, $9 25; No. 2, $7 25.....net
Bowman's Lever Cutter, $6·25.....25 %
Files.—Black Diamond, Mill.....dis 70 %
" Bastard.....dis 30 %
" Taper.....dis 30 %
Forges and Blowers.
Keystone Portable Forge Co.'s.....dis 5 %
Forks and Hoes.
Auburn Mfg. Co.'s Hay and Manure Forks
new list.....dis 15 %
Auburn Mfg. Co.'s Handled Hoes. .new list, dis 15 %
Garden Seed Drills and Wheel Hoes.
Allen's Double Wheel Hoe.....new list, dis 20 %
" Planet Drill, Nos. 2 and 3.....new list, dis 25 %
" Combined Drill and Wheel Hoe " dis 25 %
Grain Register.—"Excelsior".....$13 00
Grinding Mills.—Challenge Feed Mills.....dis 20 %
Sedgebeer's Nonpareil Mills.....dis 20 %
Bradford's French Burr Mills.....dis 5 %
Osage Corn & Cob Mill.....$34 00
Handles.—No. 1 Fork, Hoe and Rake.new list, dis 25 %
No. 2 Fork, Hoe and Rake.....new list, dis 30 %
Ax, Pick, Sledge and Small Handles.....net list
Hand Carts.—"Champion".....dis 10 %
Hay and Cotton Presses.
Dederick's Railroad.....dis 10
" Perpetual.....dis 10
Hay Knives.
Dunn Edge Tool Co.'s.....₩ doz $12 00 net
Lightning (Weymouth's Patent).....₩ doz $19 00
Horse Nails.—National Patent Pointed..... 20c rate
National Patent Pointed, extra finished..... 25c "
Horse Powers.—Pitts or Carey's Patent.....dis 10 %
Wheeler's Railway.....dis 10 %
Sandwich Lever.....dis 10 %
Hose.—
Boston Belting Co.'s Rubber Medium Sizes.....dis 50 %
" " S. Siz. Hydrant..dis 65 %
Ice Tools.....new list net
Lawn Mowers.—Charter Oak & Aachidedian dis 30 %
Money Drawers.—
Pierpont & Co.'s Excelsior.....per doz $38·00 net
Nails.—Wheeling Riverside Brand.....$2 55 rates
Packing.—Boston Belting Co.'s Rubber, Plain..dis 50 %
Boston Belting Co.'s Rubber, Pure.....dis 25&5 %
" " No. 3 Plain.....dis 40 %
" " Round and Square.....dis 40 %
Plows.—Avery's Cast and Steel.....new list, dis 30 %
Avery Sulky Plow.....new list, dis 25 %
Collins Cast Cast Steel.....new list net
Plow Sulky.—Buckeye.....$27 00 net
Post Hole Augers.—Clark's Patent—
No. 1, ₩ doz. $27; No. 2, $30; No. 3, $32..... dis 25 %
Pulleys.—5 inch.....per doz $3·00 net
4 inch.....per doz 2·50 net
Pumps.—St. Louis, Farm, Patent Metal Lined..dis 30 %
Rakes.—Advance Sulky.....each $24 00 net
St. Louis Revolving 14 tooth..... 4 15 net
" " 16 " ..... 4 65 net
" Hand Hay Rake.....per doz $2·50
Reaper Knives and Sections.—
Geo. Barnes & Co.'s Knives.....dis 40 %
" " Sections.....dis 40 %
Road Scrapers.—Steel.....each $3·00
Cast Iron.....dis 10c 5
Saws.—Curtis & Co.....dis 15%
Scythes.—Dunn Edge Tool Co.'s.....dis 35 %
Shovels and Spades.—Groom Shovel Co.....dis 40 %
Grain Scoops—Patent Corr'g Grain Groom Shovel Co
.....dis 40 %, and 50c per doz extra
So. M. Rowland & Co., dis 30 % and 50c " "
Snaths and Cradles.—Seymour Mfg. Co.'s.....dis 25 %
Sorghum Machinery.—Bell Cane Mills.....dis 30 %
Scantlin's Seamless Pans and Evaporators.....dis 20 %
Springs.—Cleveland Spring Co.'s—
Carriage and Express.....₩ lb 4 c
Steam Engines.—Bookwalter.....dis 5 %
Trade.....dis 10 %
Mansfield.....dis 10 %
Thimble Skeins.—Whitewater's.....dis 40&10 %
Wheelbarrows.—Champion Iron Wheel.₩ doz $19·50
Champion Wood Wheel.....₩ doz 27·50
" Garden.....₩ doz. 39·00
Wagons.—Whitewater Farm Wagons—
Thimble Skein—
2¾ in. $66; 3 in. $67·50; 3¼ in. $70; 3½ in. $71
Wire Bale Ties.—Buckeye Double Twist.... net list
Dederick Adjustable..... new list, 1 25 %

St. Louis Metal Market.

(Corrected Weekly by Messrs. R. Sellers & Co.)

Tin Plate.

IC, 10x14, Best Char.	$ 6·50	DX, 12½x17, B. Char.	$ 9·00
IX, 10x14, " "	9·00	DXX, 12½x17 " "	11·50
IC, 12x12, " "	6·50	DXXX, 12½x17 " "	14 00
IX, 12x12, " "	9·00	IC, 20x28, " "	16·50
IC, 14x20, " "	6·50	IX, 20x28, " "	20·50
IX, 14x20, " "	9·00	IXX, 20x28, " "	25.00
IXX, 14x20, " "	11 50	IC, 14x20, Best Roof.	6 00
IXXX, 14x20, B. Char.	14·00	IX, 14x20, " "	9·50
IXXXX, 14x20, " "	16·50	IC, 20x28, " "	12·50
IC, 12x24, " "	6·75	IX, 20x28, " "	17 00
IC, 14x14 " "	13 50	IC, 10x14, Best Coke..	5·75
IX, 14x14, " "	16·50	IC, 14x20, " "	5·75
IXX, 14x14, " "	19 50	IC, 10x30, " "	9·00
DC, 12½x17, " "	6·50		

Sheet Iron.	Com'n.	S L U Sm'th.	D. Ref'd Sm'th.	Juniata Sm'th
No. 16 to 20	2·9c	3·8c	5·6c	7·2c
No. 22 to 24	3	3·8c	5·8c	7·4c
No. 26	3·10c	4· c	6· c	7·6c
No. 27	3·20c	4·2c	6·2c	7·8c

Genuine Russia Iron.
Perfect—No. 9, 10, 11, 12.....per lb. 12½c
No. 1 Stained—No. 9, 10, 11, 12.....per lb. 12½c
Tare 22 lbs. to Bdle. For less than Bdle. add 1c. ₩ lb.
Patent Planished Iron.
No. 24 to 27, A quality.....per lb.
" " B " 9½c
For less than Bdle. add 1c. per lb.
Galvanized Sheet Iron.
Juniata, or 1st quality.....dis 40 %
Block Tin.
Banca, Large Pigs.....22c | do. Small.....20c
Straits, Large Pigs.....19c | Bar.....1c
Eng. Ref'd, Large Pig...19c

Solder.			
Extra in Bars	13c	No. 2, in Bars	0c
No. 1, in "	11c	Spelter Solder	24c
Pig Lead—Pigs	5c	In Bars	6c
Antimony			13c
Bismuth			4 25
Nickel			2 50
Crucibles.—Dixon's			₩ No. 4c

Babbit Metal.

No. 1	₩ lb. 16c	No. 3	₩ lb 14c
" 2	" 14c	" 4	" 12c

Copper.
Brazier's, 30x60, 14 to 100 lbs. Sheets.....28
" " 10, 11 & 12 lbs., " " 30c
" " 8 and 9 lbs. " 32c
" " 6 and 7 lbs. " 34c
Tinned, 14x48, 14 and 16 oz.....28c
Planished, 14x48, 14 and 16 oz.....36c
" Boiler Sizes. 14 and 16 oz.....38c
Gutter Copper, 20 and 24x72, 10, 11 and 12 ₩ Sheets.30c
" " 14 lb. Sheets.....28c
Reservoir Copper, 16x60 and 18x60.....30c
Bar Copper, Square and Round, ⅜ to 1⅛ inch.....28c
" " ⅝ inch.....31c
Copper Bottoms.....30c
Soldering Coppers.....30c
Brass.
Roll, No. 10 to 28, 12 in. in width.....27c
" 30, 12 in. in width.....28c
" 32, 16 " 29c
" 34, 16 " 28c
" 36, 16 " 27c
Platers, No. 40, 6 " 30c

Brass and Copper Wire.	Brass.	Copper.		Brass.	Copper.
No. 0 to 20	30c	40c	No. 24	37c	47c
" 21	33c	43c	" 25	40c	50c
" 22	34c	44c	" 26	42c	52c
" 23	35c	45c	" 27	45c	55c

Brass Spring Wire, 2c. ₩ lb advance.
Brass Tubing.
Plain to No. 20.....45c | 5-16 inch.....45c
⅜ inch.....45c | ¼ " 35c
Copper Rivets and Burs.....dis 10 %
Brass Kettles 7 to 13 inches.....₩ lb 35c.
" " all sizes over 13 inches.....40c.
Sheet Zinc.—600 lbs. cask..... " 6½c
250 lbs. cask..... " 7 c
Sheet.....7½c
Wire.—Iron, Bright Market.....dis 50 %
Iron, Coppered Market.....dis 45 %
Fence, Nos. 7, 8 and 9..... ₩ lb 6½c
Trellis, Nos. 10 and 11..... " 4½c
" No. 12..... " 5½c
Hay Baling, Charcoal, No. 10 and 11..... " 5½c
" " No. 12..... " 5½c
Broom, Tinned, Nos. 18 to 22..... " 11c
Fence Staples.....per keg 5½c
Per lb..... " 6 "
Iron Rivets.—Black, papered.....dis 25 %
Tinned, papered.....dis 25 %
In bulk.....new 8-16 ½ 5-16 ⅜ in. diam
11½c 10½c 10 c 9½c per lb.
Sad Irons.....₩ lb 3½c
Enameled Kettles.—Standard Mfg. Co.....dis 50 %
Enameled Sauce Pans.
Standard Mfg. Co.....dis 40 %
Enameled Boilers.—Standard Mfg. Co.....dis 40 %
Dripping Pans.—Smooth Iron.....₩ lb 9c
Geneva Fluters.....per doz $13 50
Monroe Fluters..... " 12 50
Stove Polish.—Dixon's.....per gross 6 00
Gem..... 4 50
Japanese..... 3 50
Dixon's, in bulk.....₩ lb 8c
Coffee Mills.—Parker's.....dis 20 %
Granite Iron Ware.....65 & 5 %
Spoons.—New list.....net list
Retinned Iron Ware.....30 % off
Plain Stamped Ware.....10 % off
Japanned Ware.—St. Louis list.....dis
Fry Pans.....dis 50 %
Ears.....dis 40 %

ELEVATORS.

PASSENGER ELEVATORS.

FREIGHT ELEVATORS.

INDEPENDENT STEAM ELEVATOR ENGINE.

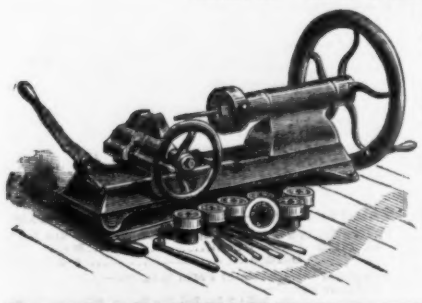
Hydraulic Elevators to run from City Pressure.
Condensed Air and Hydraulic Elevators operated by Steam Pump.
Independent Steam Elevators. Belt Power Elevators.
Portable Hoisting Machines.
All kinds of Hoisting Machinery a specialty.

STOKES & PARRISH, 3001 Chestnut St., Phila.

Wiley & Russell Mfg. Co.,

GREENFIELD, MASS.

PAT. SCREW CUTTING MACHINERY AND TOOLS, &c., &c.



The Lightning Screw Plate,
Lightning Bolt Cutters,
Green River Drilling Machines,
Green River Tire Upsetters,
&c., &c.

FRASSE & COMPANY,

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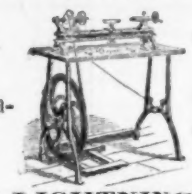
Manufacturers, Importers and Exporters of

Fine Tools & Supplies for Machinists, Blacksmiths and Fine Metal Workers.



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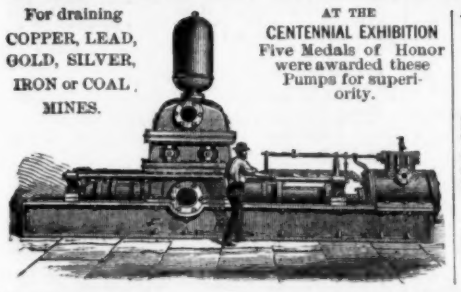
Henry Whiton's Celebrated 2 in. Lever Chuck.
The Briggs Lathe. Howell's Turning Lathes, Driving Wheels, &c., &c.

New York Agents for THE LIGHTNING SCREW PLATE.

Knowles' Patent Improved Mining Pumps.

For draining COPPER, LEAD, GOLD, SILVER, IRON or COAL MINES.



AT THE CENTENNIAL EXHIBITION
Five Medals of Honor were awarded these Pumps for superiority.

Arranged with Special Reference to Working Water Containing Dirt, Gritty Matter or Acid.

Pumps of capacity of over one million gallons per day are now delivering water through 600 feet vertical column, working entirely without shock or jar, the entire stoppages of Pump aggregating less than twelve hours per year.

ADDRESS

Knowles' Steam Pump Works,
92 & 94 Liberty St., New York.

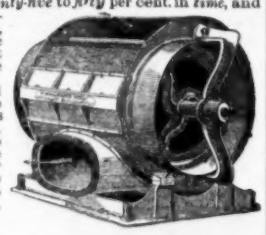
THE MACKENZIE PATENT CUPOLA & BLOWER.

Send for circular to

Smith & Sayre Mfg. Co.,
PROPRIETORS, 21 Cortlandt St., New York.

This Cupola has made a great revolution in melting Iron. It differs from all others in having a CONTINUOUS TUYERE, or in other words, the blast enters the fuel at all points. Above one ton capacity per hour, they are made *oval in form*. This brings the blast to the center of the furnace with the *least resistance* and *smallest* possible amount of power, and in combination with the continuous Tuyere causes complete diffusion of the air throughout the furnace, and uniform temperature, melting *ten* or *fifteen tons* an hour with the pressure of blast required to melt *two* or *three* tons in an ordinary Cupola. It also enables us to save very largely in *time* and *fuel*, the experience of our customers showing a gain of *twenty-five* to *fifty* per cent. in *time*, and *twenty-five to forty* per cent *fuel* over the ordinary Cupola, and a BETTER QUALITY OF CASTING, especially in light work. This is due to the thorough diffusion of the air, and more perfect combustion, extracting less carbon from the iron, making a softer and tougher casting.

We manufacture these Cupolas of any desired capacity, numbered from 1 to 20, inclusive, the numbers indicating the melting capacities in TONS PER HOUR—No. 1, one ton; No. 2, two tons; No. 3, three tons per hour, and so on up to 15 or 20 tons. We have *improved* the *construction* of these Cupolas in every way, have increased their strength and durability, and sought to make them as convenient for working and repairs as our own, and the experience of our customers, could suggest.



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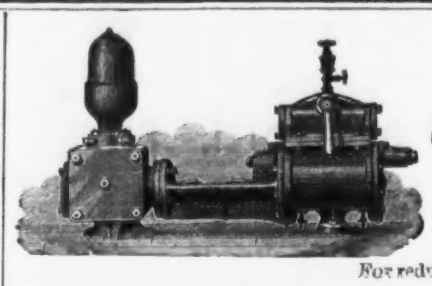
For High or Low Pressure Engines.

Delivers feed water at 210° Fahrenheit.
Prevents formation of scale. Removes old scale.
The only heater applicable to condensing engines. Over 3500 in use in the United States and England. A saving of 15 to 25 per cent. in fuel is secured by its use. Send for circular.

I. B. DAVIS, Hartford, Conn.
Sole Proprietor and Manufacturer.

See advertisement in first issue of each month.



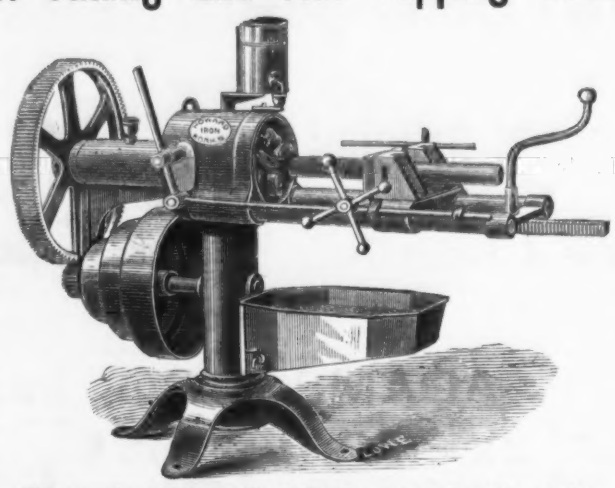
A. S. CAMERON'S PATENT "SPECIAL" STEAM PUMP

Is the Standard of Excellence at Home and Abroad.

For reduced price lists address **A. S. CAMERON, East 23d Street, New York.**

SCHLENKER'S Screw Cutting and Nut Tapping Machines.

No. 5 cuts from ¼ to 1¼ inches, price.....$250
No. 5½ " ⅛ to 2 " 350
No. 6 " ⅜ to 3 " 700
No. 8 " ⅜ to 3 " 500
No. 4 (Double Header) cuts from ¼ to ⅞ inch, price, 350



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Send for complete (illustrated) catalogues.
Cuts **300** ¼-inch Bolts, 2 inches each, in one hour.

This engraving represents a No. 5½ Machine, and cuts from ⅜ to 2 inches.

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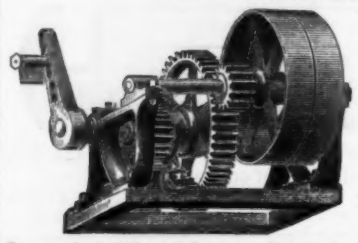
BEECHER & PECK,

Successors to Milo Peck (deceased), Manufacturers of



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Newspaper Directing Machines, &c.

Special attention given to the making of all Drop Dies.

Special Machinery fitted up to order. NEW HAVEN, CONN

MANUFACTURERS' SUPPLIES.

The Best and Lowest Price.

H. A. ROGERS,
19 John Street, New York.
A few doors from Broadway.

Steam Gauges, Belting, Chucks, Drills, Packing, Governors, Jacks, Oil Cups.
STEAM PUMPS for Pumping, Fire Purposes, and Boiler Feeding.
Also VALVES, PIPING and VISES.
The Largest Stock in the City.

Keystone Portable Forges.

Several sizes and 20 styles, for every purpose from the lightest to the heaviest work. Also

PRESSURE BLOWERS AND EXHAUSTERS.

Sizes from six inches to six feet.
Send for catalogue.

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IRON AND STEEL DROP FORGINGS

All shapes, small and large, including
Gun, Pistol, Wrench Bars, &c Also, Die Sinking. Manufacturers also of Bricklayers', Moulders' and Plasterers' Tools, Saddlers' Round and Head Knives.

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Manufacturers of the following *Patented* Articles of

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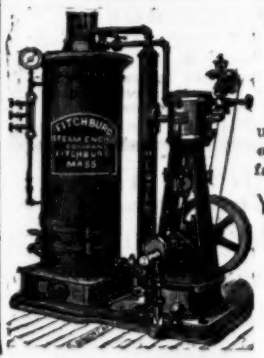
Hammer's Adjustable Clamps.
Hammer's Malleable Iron Oilers.
Hammer's Mall, Iron Hand Lamps.
Hammer's M. I. Hanging Lamps.
For Sale by all the principal Hardware Dealers.

Malleable Iron Castings
Of superior Quality and Hardware Specialties in Malleable Iron made to order.



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Vertical or Horizontal.

Combined, as in cut, 2 to 12 H. P., or on independent beds, **2 H. P.** upwards to **200 H. P.** *Plain* or with *Automatic Variable Cut-off*. We can refer to hundreds in use, of all sizes, giving perfect satisfaction.

Yacht Engines and Steel Boilers, Shafting, Pulleys, Hangers, &c.

Send for pamphlet, stating where you saw this, to

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P. BLAISDELL & CO.,

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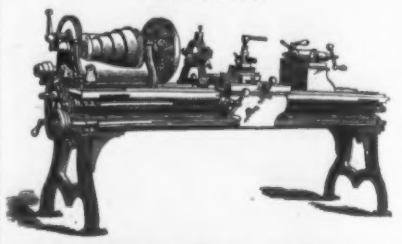

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Blaisdell's Patent Upright Drills,
With Quick Return Motion.
Engine Lathes, Planers, Boring Mills, Gear Cutters and Hand Lathes.
WORCESTER, MASS., U. S. A.

Hoisting Engines

OF ANY POWER,

WITH
Improved Patent Friction Drums.
Adapted for Mines, Dock Building, Pile Driving, Quarries, &c.

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$50 Screw Cutter.

H. L. Shepard's Celebrated **Foot & Power LATHES, Drill Presses,** Scroll, Circular and Band **SAWS,** Also FITTINGS of all kinds.
2 horse-power engine and boiler complete, $150; 4 horse-power engine and boiler complete, $250.
Send for circular.
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Quarter million in satisfactory use.

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POWER LOOMS.
Reeling, Spooling, Dyeing and Sizing Machines, Bobbin Winding Machines, Self-Acting Wool-Scouring Frames, Spindle Bobbins, Self-Acting Wool-Scouring Machines, Card and Varnish Oil Presses.
SHAFTING
With Patent Self-Oiling Hangers,
Pulleys from 4 inch to 10 feet in diameter
Pulleys in two parts.
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The most Durable, Reliable & Economical Lubricant in existence;
Applicable to every grade of machinery. Send for Circular and Price List.

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Machinery, &c.

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It is a common method to advertise Governors *without cost*, unless satisfactory to the customer, and then charge *High Prices* for doing what any good Governor will do. Various Governors inferior to the "Judson" are sold in this way, operating well enough for three months, to insure collection of the pay, but becoming useless after a year's wear—their construction lacking durability. The Judson Governor is guaranteed to be not only the best Regulator of Steam Engines, but also the most durable Governor made. Parties in buying other Governors should stipulate that their durability be guaranteed, and should also take care that they do not, for much inferior Governors, pay higher prices than those shown in the accompanying list. We guarantee the Judson Governor will do all any other Governor can do, and in accuracy and durability—the main essentials—we guarantee it shall do more.

Reduced Price List,

FEBRUARY 1, 1877.

☞ For dimensions of Governor, see Illustrated Price List.

THE JUDSON PATENT

Improved Steam Governor.

Size, Inch.	Plain.	Bright Finished.	Extra for Spe'd'r	Stop Valve.
½	$16.00	$18.00	$1.90	....
¾	18.00	20.00	1.90	....
1	20.00	22.00	2.00	$5.00
1¼	23.00	26.00	2.25	6.00
1½	26.00	30.00	2.50	8.00
2	31.00	35.00	2.75	10.00
2¼	36.00	41.00	3.25	12.00
2½	40.00	45.00	3.50	14.00
2¾	45.00	51.00	3.75	16.00
3	50.00	57.00	4.25	19.00
3½	59.00	67.00	4.50	23.00
4	69.00	78.00	5.00	28.00
4½	80.00	90.00	5.50	34.00
5	90.00	101.00	6.00	40.00
5½	105.00	117.00	6.50	46.00
6	120.00	133.00	7.00	54.00
7	142.00	156.00	8.00	65.00
8	175.00	192.00	9.00	79.00
9	198.00	218.00	10.00	....
10	210.00	240.00	12.00	....

No Charge for Boxing or Cartage.

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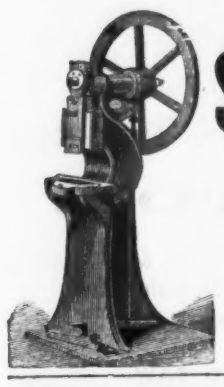
PRESSES, DROP HAMMERS, DIES,

And Other Tools

FOR THE MANUFACTURE OF ALL KINDS OF



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The Stiles & Parker Press Co.,

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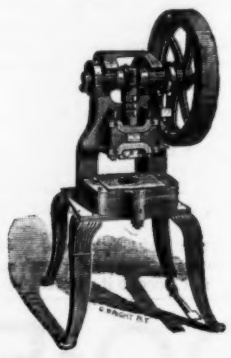
BLISS & WILLIAMS,

Manufacturers of all kinds of



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FOR WORKING SHEET METALS, &c.

Fruit and other Can Tools.

167 to 173 Plymouth St., corner of Jay, Brooklyn, N. Y.,

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Kensington, PHILAD'A

BUILDERS OF

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SHAFTING, GEARING,

AND

MILL WORK

GENERALLY.

Special Machinery

BUILT TO ORDER.

Vertical

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Engines,

Of New and Heavy Designs, from 2 to 100 H. P.,

on hand or in process of erection.

Machinery, &c.

Established 1848.

WM. SELLERS & CO.,

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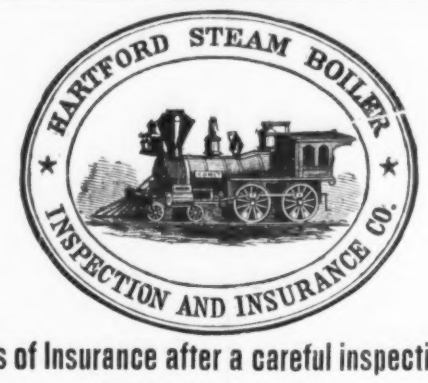

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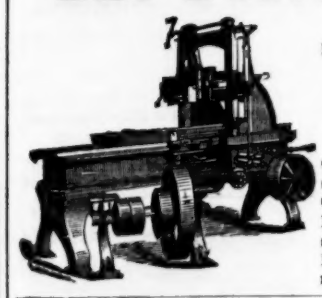

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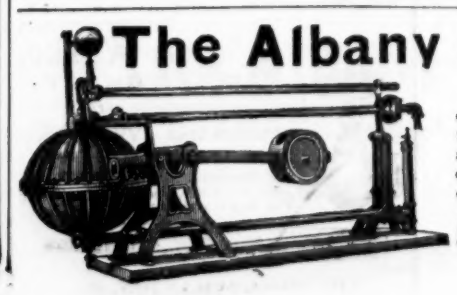

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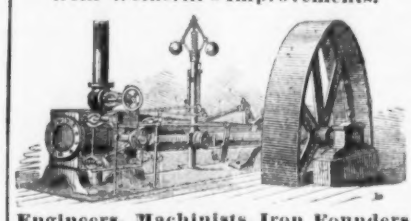

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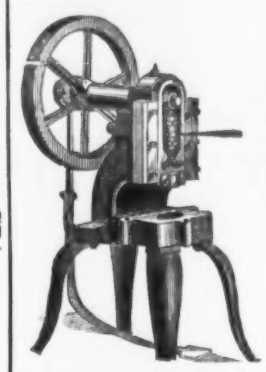

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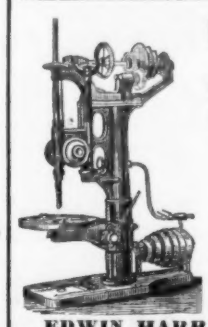

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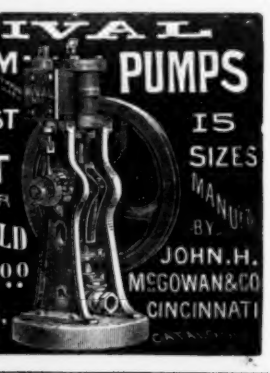

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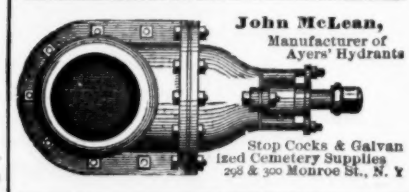

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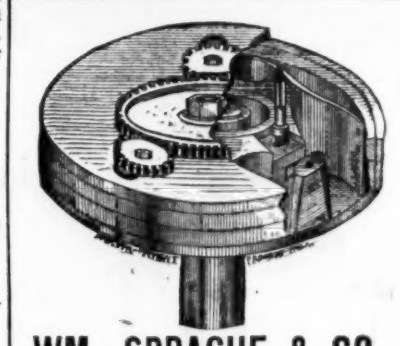

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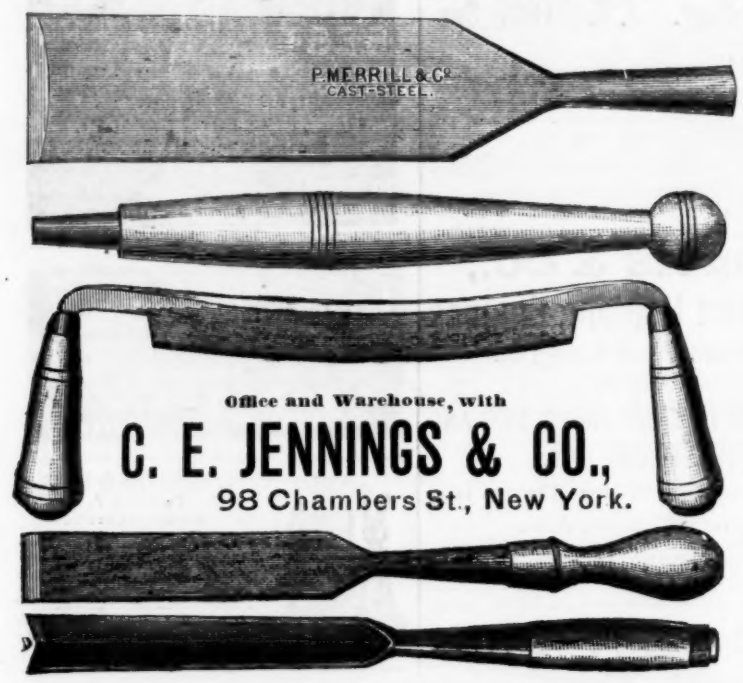

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See cut of Elevator Hoisting Machine in issue of May 16, 1878, page 39.

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"BOYNTON'S SAWS were effectually tested before the judges at the Philadelphia Fair, July 6th and 7th. An ash log, eleven inches in diameter, was sawed off, with a four-and a-half-foot lightning cross-cut, by two men, in precisely six seconds as timed by the chair man of the Centennial Judges of Class Fifteen. The speed is unprecedented, and would cut a cord of wood in four minutes. The representatives of Russia, Austria, France, Italy, Spain, Belgium, Sweden, England, and several other countries, were present, and ex pressed their high appreciation."

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